SOIL SURVEY

Plymouth County Massachusetts

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION

Issued July 1969

Major fieldwork for this soil survey was done in the period 1950–63. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1963. This survey was made cooperatively by the Soil Conservation Service and the Massachusetts Agricultural Experiment Station; it is part of the technical assistance furnished to the Plymouth Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Plymouth County contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

All of the soils of Plymouth County are shown on the detailed map at the back of this survey. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described and also the page for the capability unit.

Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about the use and management of soils from the soil descriptions and from the discussions of use of the soils for crops and pasture.

Foresters and others can refer to the section "Use of Soils for Woodland," where the suitability of the soils for trees is discussed.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the section "Use of Soils for Wildlife."

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, school sites, and athletic fields in the section "Use of Soils for Community Development."

Engineers and builders can find under "Use of Soils for Engineering Purposes" tables that give facts about the engineering properties of the soils in the county and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation, Classification, and Morphology of Soils."

Newcomers in Plymouth County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County."

Cover picture: Plimoth Plantation, a re-created Pilgrim village about 2 miles south of Plymouth Rock. Soil on which crops are being harvested is Carver coarse sand. (Photograph courtesy of Plimoth Plantation.)

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SOILS SURVEYED BY CHARLES W. UPHAM, RINO J. ROFFINOLI, AND CARL B. NEWSOME, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION

PLYMOUTH COUNTY is in the southeastern part of Massachusetts, bordering Cape Cod (fig. 1). It has an area of 424,960 acres, or 664 square miles.

The county was organized in 1685 and includes territory that was formerly Plymouth Colony. The town of Plymouth, the county seat, is the site where the Pilgrims first landed and settled in America. Brockton, which in 1960 had a population of 149,000, is the commercial center of the county and is also an important industrial center. It is noted for the manufacture of shoes.

According to the 1964 Census of Agriculture, about 25 percent of Plymouth County is in farms. The rest is mostly woodland or residential and urban areas.

Cranberries are the main crop. Dairying is important, and poultry and market garden vegetables are produced.

The woodlands, though not a major source of income, are used to supplement the income of farmers. They are also used by hunters and others for recreation.

Only a small part of the nearly 250,000 persons in the county earn a livelihood directly from farming. The northern half of Plymouth County, which has ready access to metropolitan Boston, is the more densely populated part.

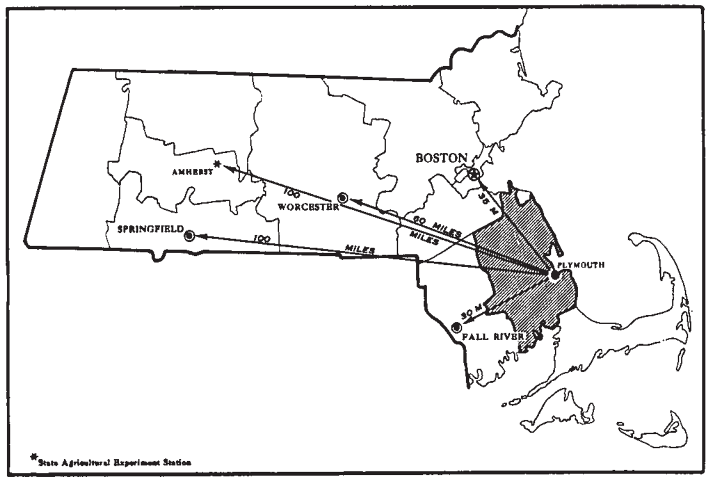

Figure 1.—**Location of Plymouth County in Massachusetts.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Plymouth County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide uniform procedures. To use this survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Agawam and Gloucester, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in natural characteristics. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Gloucester fine sandy loam and Gloucester loamy sand are two soil types in the Gloucester series. The difference in texture of their surface layer is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Gloucester loamy sand, 0 to 3 percent slopes, is one of several phases of Gloucester loamy sand, a soil type that has a slope range of 0 to 15 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed or occur in such small individual tracts that it is not practical to show them separately on the map. Therefore, such an area is shown as one mapping unit and is called a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example Hollis-Charlton fine sandy loams.

Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are not important for the purposes of this soil survey. An example is Au Gres and Wareham loamy sands.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the soil map like other mapping units, but they are given a descriptive name, such as Dune land or Fresh water marsh, and are called land types.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in a soil survey. On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Plymouth County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of two or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The nine soil associations in Plymouth County are described in the following paragraphs.

1. Tidal marsh-Dune land-Coastal beach association

Regularly flooded organic and mineral deposits; and unstable sands along the seashore

This association consists of tidal marshes, small dunes, and sandy beaches. It occurs in the northeastern part of the county and occupies about 5 percent of the total acreage.

Tidal marsh occupies about 85 percent of the association, and Dune land and Coastal beach occupy 10 percent. The remaining 5 percent consists of sandy and gravelly soils.

The largest areas of Tidal marsh are in the vicinity of Duxbury, Marshfield, and Scituate. Some of the larger marshes are protected along their seaward edges by barrier beaches or by bay-mouth bars, such as the one on which Duxbury Beach is located.

Tidal marsh varies greatly in composition. Some areas consist mainly of organic material, others of mineral material, chiefly silt and clay. All areas are partly or completely flooded every 12½ hours.

Coastal beach formed from highly quartzose sand that was transported and sorted by the action of wind and waves. The dunes commonly are few and small.

Tidal marsh is valuable as habitat for various kinds of waterfowl, for some mammals, and for many marine organisms. Coastal beach provides valuable recreation areas.

2. Quonset-Hollis-Bernardston association

Level to sloping, well-drained to excessively drained soils, deep and shallow to bedrock, that formed in glacial till or in outwash materials

This association, which occupies about 4 percent of the county, occurs in the northernmost part, chiefly in the vicinity of Hingham and Scituate. It is characterized by small irregular hills and knobs from which bedrock out-

crops; by smooth rounded hills about 200 feet high, called drumlins; by level plains; and by steep terraces (fig. 2).

Quonset soils occupy about 30 percent of the association; Hollis and Charlton soils, which are intermingled, occupy about 30 percent; and Bernardston soils about 15 percent. The remaining 25 percent consists of secondary soils.

Quonset soils are on droughty, level plains and steeply sloping terraces. Hollis soils occupy the shallow-to-bedrock parts of the knobby hills and are intermingled with deep, well-drained Charlton soils. Bernardston soils are on drumlins. They are deep, well-drained soils underlain by firm, platy glacial till.

Warwick soils, which are similar to the Quonset but finer textured, are important secondary soils on the plains and terraces. Other important secondary soils are the moderately well drained Scituate and the well drained Essex, which are also on drumlins, and the very poorly drained Muck soils, which are in depressions.

This association is used principally for residential developments and for woodland. Its proximity to Boston has resulted in much of the farmland being converted to homesites. The woodland consists of fairly good mixed stands of hardwoods and white pine.

3. *Scituate-Essex-Merrimac association*

Deep, nearly level to moderately steep, well drained and moderately well drained soils formed in glacial till; and nearly level, somewhat excessively drained soils formed in sand and gravel

This association, which occupies about 19 percent of the county, extends across the northern part, from Brockton and Bridgewater on the west to Scituate on the east. Hills and ridges are interspersed among broad, low-lying plains and terraces. The slopes for the most part are gentle to moderately steep. A few are steep. The maximum elevation is less than 200 feet.

The moderately well drained Scituate soils make up 30 percent of the association, the well drained Essex soils 15 percent, and the somewhat excessively drained Merrimac soils about 15 percent. Secondary soils make up about 40 percent.

The Essex and Scituate soils occupy the uplands. They are deep, gently sloping to moderately steep coarse sandy loams underlain at a depth of 18 to 30 inches by firm but coarse glacial till. The Merrimac soils occupy the nearly level plains and terraces.

Important secondary soils are the droughty, gravelly Hinckley soils; the very poorly drained, stony Brockton soils; and very poorly drained Muck.

Much of this association is used for residential purposes, a small acreage is used for dairying, and the rest is forested with mixed stands of hardwoods and white pine. Seepage is prevalent throughout the association because of the firm underlying till.

4. *Hinckley-Merrimac-Muck association*

Deep, excessively drained to well-drained soils formed in sand and gravel; and deep, very poorly drained organic soils in outwash areas

This association, which occupies about 26 percent of the county, is most extensive in the central part. It consists of broad, low ridges; nearly level plains and terraces; and knobby, irregular ridges. Intermingled with these are extensive low, flat, wet areas (fig. 3). The elevation is generally between 50 and 150 feet.

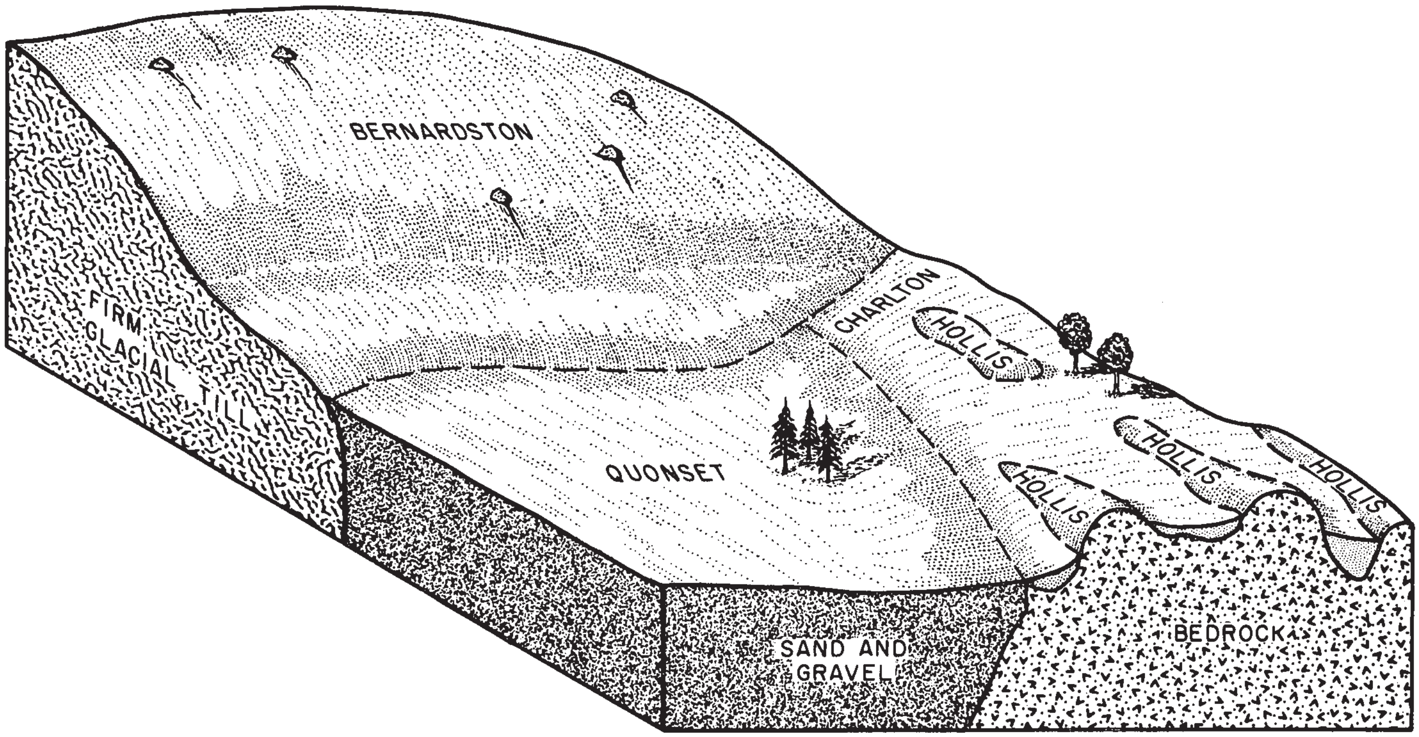

***Figure 2.*—Relationship of soils to topography and underlying material in association 2.**

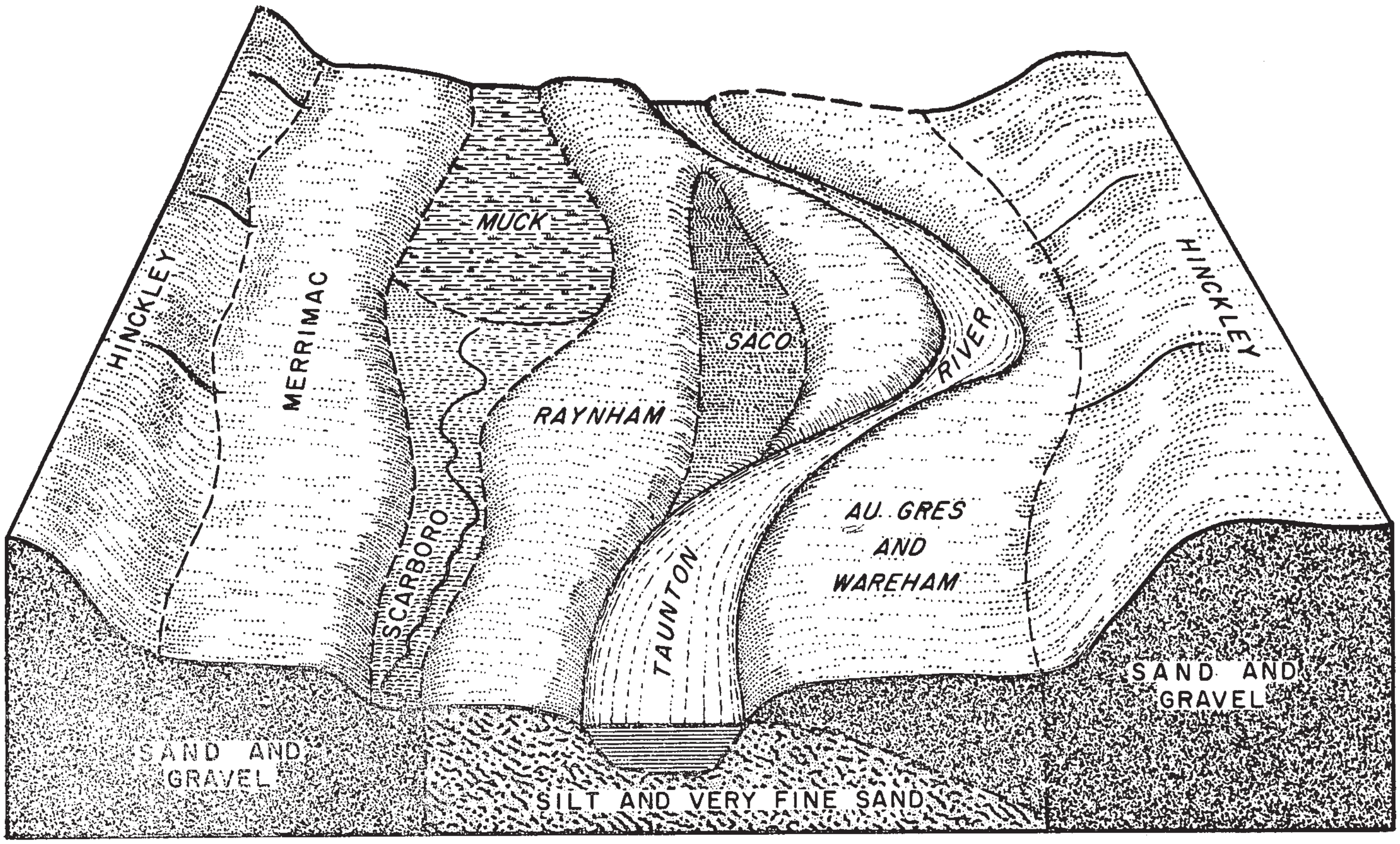

Figure 3.—**Relationship of soils to topography and underlying material in associations 4 and 5.**

Hinckley soils make up about 35 percent of this association, Merrimac soils about 20 percent, and areas of Muck about 10 percent. Secondary soils make up the rest.

The soils in this association formed mainly in glaciofluvial sand and gravel. Hinckley soils are deep, excessively drained gravelly loamy sands on gentle to steep slopes. Merrimac soils are well-drained and somewhat excessively drained sandy loams underlain by sand and gravel. Muck is an organic soil that occurs in low-lying areas.

Important secondary soils are the very poorly drained sandy and gravelly Scarboro soils, the excessively drained coarse sandy Carver soils, and very poorly drained Peat.

Much of this association is forested with fairly good stands of white pine, although new residential construction is widespread. The numerous clear, sandy-bottomed ponds provide recreation.

The chief farming enterprise is the production of cranberries. Small acreages are used for dairying and for market gardens.

5. *Merrimac-Raynham-Saco association*

Level to moderately steep soils formed in sand and gravel or lacustrine silty materials on terraces, old lakebeds, and flood plains

This association, which occupies about 5 percent of the county, occurs in the west-central part, in the Taunton River basin. It consists of broad, flat, low, wet areas interspersed with moderately sloping, well-drained areas (see fig. 3). The stream valley is poorly defined, and the flood hazard is slight. The elevation for the most part is between 50 and 150 feet.

Merrimac soils occupy about 40 percent of this association, Raynham soils about 15 percent, and Saco soils about 10 percent. Secondary soils occupy the rest.

The slopes are occupied mainly by Merrimac soils. These soils are deep, well-drained and somewhat excessively drained fine sandy loams underlain by sand and gravel. The low-lying areas are occupied chiefly by the poorly drained Raynham and the very poorly drained Saco soils, which formed in deep silt and very fine sand.

Important secondary soils in the low-lying areas are the poorly drained Au Gres and Wareham soils, which formed in sand and gravel, and the moderately well drained Ninigret soil, silty subsoil variant, which formed in sandy material over silt. Hinckley and Windsor soils are important secondary soils on slopes.

Dairying is the principal farming enterprise. Crops on the finer textured soils respond well to fertilization, and good hay and silage crops are produced. Most of the untilled acreage is forested, chiefly with white pine or with mixed stands of red maple, beech, elm, scarlet oak, red oak, and other hardwoods.

6. *Gloucester-Windsor-Brockton association*

Level to steep, excessively drained to well-drained, and very poorly drained soils formed in glacial till or outwash materials

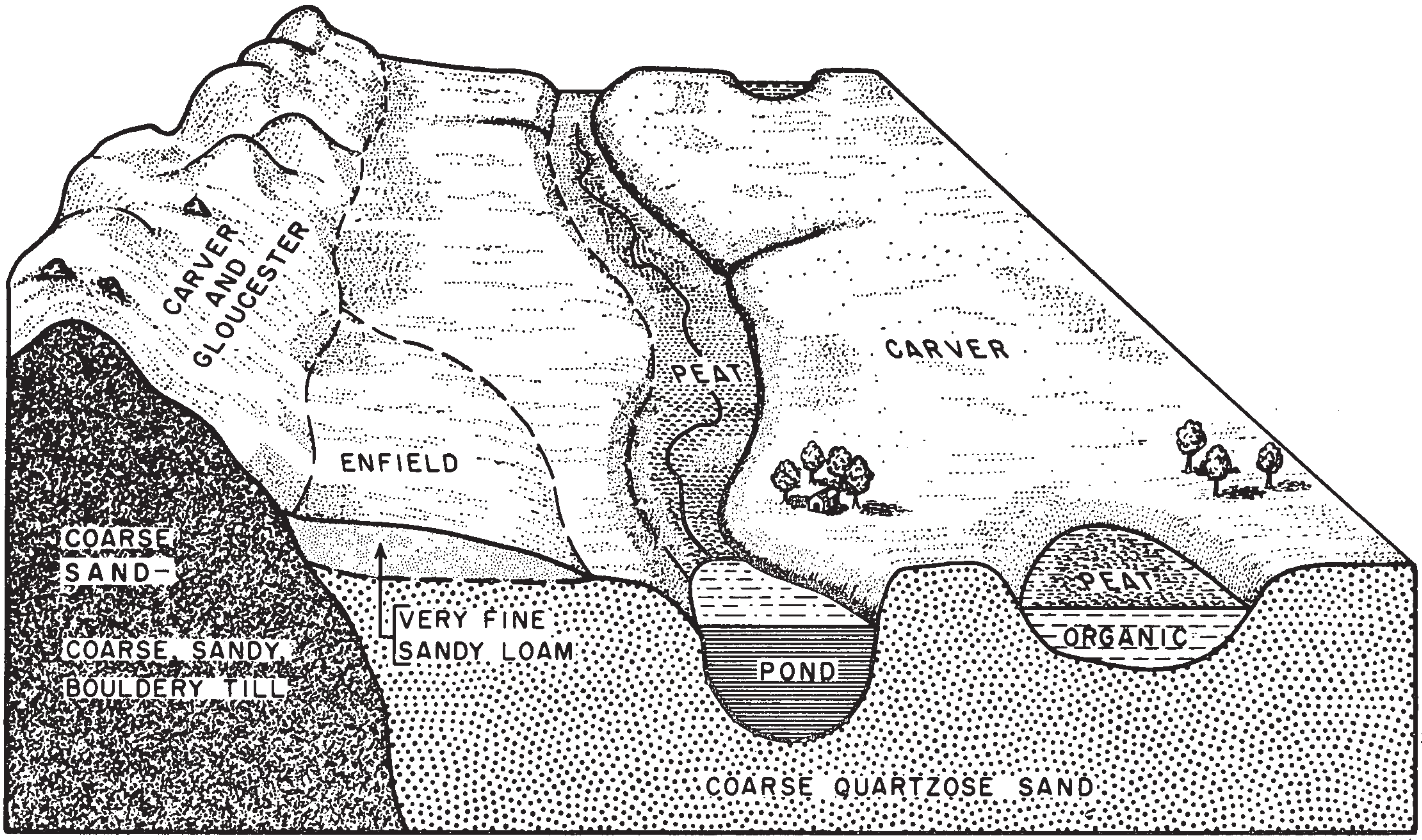

Figure 4.—Relationship of soils to topography and underlying material in associations 7 and 8.

This association, which occupies about 12 percent of the county, is most extensive in the southwestern part, from Lakeville to Marion. It consists of low rolling hills interspersed with plains and low wet areas. The elevation ranges from sea level to 150 feet.

Gloucester soils occupy about 30 percent of this association, Windsor soils about 20 percent, and Brockton soils about 15 percent. Secondary soils make up the rest.

Gloucester soils formed in stony glacial till. They are deep, somewhat excessively drained or well drained, and gently to moderately sloping. Surface stones have been removed from many areas to facilitate tillage. Windsor soils formed in deep sand. They are free of stones but are droughty. Brockton soils occur in low-lying areas and are very poorly drained.

Important secondary soils are Peat and Muck, which are closely associated with the Brockton soils, and the closely associated Hollis and Charlton soils. Hollis soils are shallow to bedrock.

Dairying and the growing of cranberries are the principal farming enterprises. Most of the acreage is wooded. White pine and scarlet oak cover much of the uplands and plains, and red maple is prevalent on the wet lowlands. The shore along the southern boundary of this association is used for recreational activities, and in this area there are numerous summer cottages, many beaches, and several fine harbors.

7. *Carver-Peat association*

Nearly level to steep, excessively drained soils formed in deep outwash sands; and very poorly drained organic soils in low areas

This association occupies about 15 percent of the county and makes up a large part of the south-central part. It consists of a large, nearly level, sandy outwash plain (fig. 4) that is pitted with kettle holes and is dissected by southward flowing streams. In most places the elevation is less than 100 feet.

Carver soils occupy about 70 percent of this association, and Peat occupies about 10 percent. The remaining 20 percent is occupied by secondary soils.

Carver soils consist of droughty coarse sands that formed in deep deposits of sand, on the nearly level plain (fig. 5) and along the steep sides of kettle holes and stream channels. Peat occurs on the bottoms of drainageways and in some of the deeper kettle holes.

The droughty, gravelly Hinckley soils and the sandy Gloucester soils are secondary soils.

Low-quality woodland of pitch pine and scrub oak covers most of the acreage. These trees are able to regenerate following damage by fire. Farming on the Carver soils is limited to growing some truck crops for sale at local roadside stands. Most areas of Peat have been developed for the production of cranberries. The shore along the southern

Figure 5.—**Typical view of associations 7 and 8. In foreground, Carver soils on the plain. In background, Carver and Gloucester soils on a moraine.**

boundary of this association faces Buzzards Bay and is a highly developed recreational area.

8. Carver-Gloucester association

Level to steep, excessively drained and somewhat excessively drained soils formed in deep sand and glacial till on outwash plains and ground moraines

This association extends southward from the town of Plymouth and covers much of the southeastern part of the county. Its chief features are a series of wooded and boulder-strewn moraine hills (see figs. 4 and 5). Slopes are moderate to steep and are complex. Along the eastern boundary, large wavecut cliffs face Cape Cod Bay. The total acreage makes up about 12 percent of the county.

Carver soils occupy about 50 percent of the association, and Gloucester soils about 40 percent. Secondary soils occupy the rest.

The soils of this association consist principally of deep, droughty loamy sands. The Carver soils, which formed in deep, coarse quartzose sand or gravelly sand, are free of boulders. The Gloucester soils are bouldery and contain many coarse subrounded fragments. Both soils commonly have a thin, gray mineral surface layer. Secondary soils consist mainly of small deposits of Peat and some small areas of marsh.

Nearly all of the acreage is wooded, principally with pitch pine and scrub oak. These trees are able to regenerate following damage by fire. The shore along the eastern boundary faces Cape Cod Bay and is densely populated during the summer months. Clear, sandy-bottomed lakes and ponds also provide recreation.

9. Hollis-Charlton-Essex-Muck association

Rolling, somewhat excessively drained and well-drained soils, deep and shallow to bedrock, that formed in glacial till; and level, very poorly drained organic soils

This association forms a narrow strip along the northern edge of the county, from the Bristol County line to west of Hingham. It makes up about 2 percent of the total acreage. Irregular knobs and smooth, rounded hills are interspersed with low-lying muck flats. Slopes for the most part are gentle or moderate. A few are steep. Bedrock is exposed on the knobs.

The Hollis and Charlton soils make up about 25 percent of this association, the Essex soils about 25 percent, and areas of Muck about 10 percent. Secondary soils make up the rest.

The soils of this association formed chiefly in stony glacial till. The Hollis and Charlton soils are fine sandy loams. They occur on irregular, knobby hills where outcrops of bedrock are common. The Essex soils are well-drained coarse sandy loams, underlain at a depth of 24 to 30 inches by firm glacial till. Muck is an organic soil that formed from decayed plant remains. The droughty Hinckley and Gloucester soils are important secondary soils.

Much of this association is used for residential purposes. A small acreage is used for market gardens, and the rest is forested with mixed stands of hardwoods and white pine. Water seepage is common in areas that are underlain by till.

Use and Management of Soils

This section gives information on the use and management of soils for crops and pasture, on the use of the soils for community developments and for engineering purposes, and on the management of soils for woodland and for wildlife habitat.

Use of Soils for Crops and Pasture

In this subsection the system of capability grouping is explained, and then each capability unit is described. At the end of this subsection, estimated yields are given for specified soils under two levels of management.

Capability groups of soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment when used for the common field crops or for sown pasture. The classification does not apply to most horticultural crops or to cranberries, rice, and other crops that have special requirements. The soils are classified according to the degree and kind of permanent limitation, but without consideration of major and generally expensive land-forming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I. Soils have few limitations that restrict their use.

Class II. Soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV. Soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V. Soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII. Soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s* or *c*, *to* the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-2 or IIIe-5. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within the subclass.

The numbering of the capability units in this survey is not consecutive, because the soils were assigned to capability units on a statewide basis, and only part of the units in the State are represented in Plymouth County.

Management by capability units

The soils are grouped into capability units according to their suitability for crops and pasture. In the description of the units, the soil characteristics important to agriculture are discussed, suitable crops and other uses are suggested, and the main requirements of good management are given.

The names of the soil series represented are mentioned in the description of each capability unit. This does not

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mean that all the soils of a series are in a given capability unit. To find the capability classification of any given soil, refer to the "Guide to Mapping Units" at the back of this survey.

All of the soils in the county are low to very low in natural fertility and are naturally acid. The need for lime and plant nutrients depends on past management and on cropping practices. Consequently, lime and fertilizer requirements should be determined by soil tests.

Recommendations on crop varieties and perennial forage seed mixtures can be obtained from publications of the Agricultural Extension Service, College of Agriculture, University of Massachusetts, at Amherst. The Agricultural Extension Service and the Soil Conservation Service can help interpret the recommendations for soils on a specific farm. They can also give technical advice on land preparation, cropping systems, diversions, drainage, woodland management, pasture management, and other phases of farming.

CAPABILITY UNIT I–2

Essex coarse sandy loam, 0 to 3 percent slopes, is the only soil in this unit. This is a deep, well-drained soil that formed in glacial till. It is only slightly eroded. A compact layer, or fragipan, at a depth of 24 to 30 inches restricts the downward movement of water and the growth of roots. Stones and boulders occur in the soil material, and a few are on the surface.

This soil is rapidly to very rapidly permeable above the fragipan and slowly permeable within the fragipan. It is strongly acid to extremely acid unless limed, and it is low in organic-matter content.

This soil is suited to most of the market garden crops commonly grown in the county. It is also well suited to hay and silage corn. Alfalfa grows well but is sometimes damaged by frost heaving during the winter or early in spring. Crops, grasses, and legumes are seldom damaged by lack of moisture.

This soil can be used intensively with little risk of erosion. Careful management is needed to maintain the organic-matter content and to preserve good tilth.

A suitable cropping system consists of continuous row crops followed each year by a winter cover crop. The response to lime and fertilizer is favorable.

CAPABILITY UNIT I–3

Gloucester fine sandy loam, firm substratum, 0 to 3 percent slopes, is the only soil in this unit. This is a deep, well-drained soil that formed in coarse glacial till. It is slightly eroded. The surface layer contains small rock fragments, cobblestones, and a few stones. Stones and boulders occur below the surface layer.

This soil is rapidly to very rapidly permeable in the upper part. In most places it has a firm, slowly permeable substratum at a depth of 3 to 5 feet. It is moderate to low in moisture-holding capacity, low in organic-matter content, and extremely acid or very strongly acid unless limed.

This soil is suited to most crops grown in the county and is especially well suited to silage corn or hay. It can be used intensively with little risk of erosion if care is taken to maintain the organic-matter content and to preserve good tilth.

A suitable cropping system consists of continuous row crops followed each year by a winter cover crop, which can be used as green manure. The response to lime and fertilizer is favorable.

CAPABILITY UNIT I–5

This unit consists of deep, nearly level, well-drained soils of the Agawam, Enfield, Merrimac, and Warwick series. These soils are only slightly eroded. They are underlain by silt, sand, or sand and gravel at a depth of 20 to 30 inches.

All of the soils in this unit are rapidly to very rapidly permeable, except Agawam fine sandy loam, silty subsoil variant, 0 to 3 percent slopes, which has a slowly permeable or moderately slowly permeable layer at a depth of 2½ to 3½ feet. They are all moderate or high in moisture-holding capacity, low in organic-matter content, and extremely acid or very strongly acid unless limed.

These soils are well suited to most of the crops commonly grown in the county. They are particularly well suited to market garden crops but are also productive of hay, pasture, and silage corn. They can be used intensively for crops if care is taken to keep the organic-matter content, the supply of plant nutrients, and the reaction at suitable levels.

A suitable cropping system for the Agawam soils in this unit consists of 2 years of a row crop and 1 year of a green-manure crop. A winter cover crop should follow the first year of a row crop. A suitable cropping system for the other soils consists of continuous row crops followed each year by a winter cover crop.

These soils are readily leached of plant nutrients. Thus, several small applications of fertilizer are more effective than one large application. The response to lime and fertilizer is good.

CAPABILITY UNIT IIe–2

This unit consists of deep, well-drained soils of the Bernardston and Essex series. These soils formed in compact glacial till. They are gently sloping and are moderately eroded. A fragipan, at a depth of 24 to 30 inches, restricts the movement of water and the growth of roots. Stones and boulders occur in the soil material.

These soils are moderately to very rapidly permeable above the fragipan and slowly permeable within the fragipan. They are moderate or high in moisture-holding capacity, low to moderate in organic-matter content, and strongly acid to extremely acid unless limed.

The soils of this unit are well suited to most market garden crops grown in the county and are especially well suited to hay and silage corn. Alfalfa grows well but is sometimes damaged by frost heaving during winter and early in spring. Crops, grasses, and legumes are seldom damaged by lack of moisture during the growing season.

These soils are susceptible to erosion and if used intensively need to be protected by contour cultivation, stripcropping, grassed waterways, and other conservation measures.

A suitable cropping system consists of 2 years of a row crop, then 2 years of grass or of a mixture of grasses and legumes. The row crop should be grown on the contour. A winter cover crop should follow the first year of a row crop. These practices help to control runoff, to maintain the organic-matter content, and to preserve good tilth. The response to lime and fertilizer is favorable.

CAPABILITY UNIT IIe–3

Gloucester fine sandy loam, firm substratum, 3 to 8 percent slopes, is the only soil in this unit. This is a deep, well-

drained soil that formed in glacial till. It is moderately eroded. The surface layer contains small rock fragments, cobblestones, and a few stones. Stones and boulders also occur below the surface layer.

This soil is rapidly to very rapidly permeable. In most places, it has a firm, slowly permeable substratum at a depth of about 2½ to 5 feet. It is moderate to low in moisture-holding capacity, low in organic-matter content, and extremely acid or very strongly acid.

This soil is suited to most crops grown in the county, especially silage corn or hay. It can be used intensively for crops if conservation measures are taken to control erosion, to maintain the organic-matter content, and to preserve good tilth. The measures most effective in controlling erosion are contour cultivation and, on long slopes, diversions, stripcropping (fig. 6), and grassed waterways.

A suitable cropping system consists of 2 years of a row crop and 1 year of a green-manure crop. A winter cover crop should follow the first year of a row crop. The row crop should be grown on the contour. The response to lime and fertilizer is favorable.

CAPABILITY UNIT IIe-5

In this unit are deep, gently sloping, well-drained soils of the Agawam, Enfield, Merrimac, and Warwick series. These soils formed in stratified, water-sorted material and are underlain by silt, sand, or sand and gravel at a depth of 20 to 30 inches.

All of the soils in this unit are moderately rapidly to very rapidly permeable, except Agawam fine sandy loam, silty subsoil variant, 3 to 8 percent slopes, which has a slowly permeable or moderately slowly permeable layer at a depth of 2½ to 3½ feet. They are all moderate or high in moisture-holding capacity, low in organic-matter content, and very strongly acid to slightly acid.

These soils are well suited to most of the crops grown in the county. Some are especially well suited to truck crops. During a dry growing season, crop yields are limited because of the lack of moisture.

Because of their slope, these soils are susceptible to water erosion. A suitable cropping system, stripcropping, contouring, and seeding help to control erosion.

Figure 6.—Contour stripcropping on subclass IIe soils.

A suitable cropping system for the Agawam and Enfield soils consists of 2 years of a row crop, then 2 years of grass or of a mixture of grasses and legumes. A winter cover crop should follow the first year of a row crop. The row crop should be grown on the contour. A suitable cropping system for the other soils in this unit consists of continuous row crops followed each year by a winter cover crop. The response to lime and fertilizer is favorable.

CAPABILITY UNIT IIe-7

This unit is made up of somewhat excessively drained and well-drained, gently sloping, moderately eroded soils of the Charlton and Hollis series. The Hollis soil, which is underlain by bedrock at a depth of 2 feet or less, is interspersed with pockets of the deeper Charlton soil. These soils formed in thin deposits of glacial till. In places there are outcrops of bedrock.

The moisture-holding capacity is low in the shallow Hollis soil and moderate in the deeper Charlton soil. Permeability is moderate to rapid, the organic-matter content is low, and the reaction is extremely acid or very strongly acid.

These soils are suited to truck crops, silage corn, hay, or pasture. Because of their gentle slopes, they are subject to erosion. Erosion can be controlled by stripcropping, contouring, suitable cropping systems, and other conservation measures.

If row crops are grown, the cropping system should include 2 years of a row crop and 1 year of a green-manure crop. A winter cover crop should follow the first year of a row crop. The row crop should be grown on the contour. In most years, irrigation is required if a row crop is grown. The response to lime and fertilizer is favorable.

CAPABILITY UNIT IIw-2

This unit consists of deep, moderately well drained soils of the Pittstown and Scituate series. These soils formed in compact glacial till. They are nearly level to gently sloping and are slightly to moderately eroded. A compact layer, or fragipan, at a depth of 18 to 30 inches restricts the vertical movement of water and the growth of roots.

The soils of this unit contain a relatively small amount of organic matter and are extremely acid or very strongly acid. They are moderately to rapidly permeable in the upper part and are high or moderate in moisture-holding capacity. The fragipan is moderately slowly or slowly permeable and is low in moisture-holding capacity.

These soils are saturated until late in spring because the fragipan restricts drainage. Undrained areas are suitable for hay or pasture and are used mainly for this purpose. Drained areas are suitable for silage corn, potatoes, vegetables, alfalfa, and other crops. The gently sloping areas are susceptible to erosion. Conservation measures needed in these areas to help control erosion include a suitable cropping system, arrangement of rows to improve drainage, and seeding.

On the nearly level soils that are drained, a suitable cropping system consists of 2 years of a row crop and 1 year of a green-manure crop. On gently sloping soils that are drained, a suitable cropping system consists of 2 years of a row crop and 2 years of grass or of a mixture of grasses and legumes. A winter cover crop should follow the first year of a row crop. The response to lime and fertilizer is favorable.

CAPABILITY UNIT IIw-4

This unit consists of deep, moderately well drained, medium-textured soils of the Belgrade series. These soils formed in lake deposits of silt and very fine sand. They are nearly level to gently sloping and are slightly to moderately eroded.

The soils of this unit contain only a small amount of organic matter and are extremely acid to strongly acid. They are high in moisture-holding capacity and, therefore, are somewhat difficult to work. Permeability is moderate or moderately slow in the solum and moderately slow or slow in the substratum. Drainage is a problem in the more nearly level areas, and erosion is a hazard on slopes.

These soils are saturated until late in spring. Consequently, tillage is delayed. Although silage corn and vegetables can be grown, hay and pasture crops are more suitable. Drainage is needed if row crops are grown.

A suitable cropping system in drained areas consists of 2 years of a row crop and 3 years of grass or of a mixture of grasses and legumes. A winter cover crop should follow the first year of a row crop. An arrangement of rows to improve drainage and control erosion is important on the gently sloping soils. Other desirable conservation measures are seeding, grassed waterways, and diversions.

These soils need to be worked within a fairly narrow range of moisture content to avoid puddling and compaction. If pastures are grazed when wet, trampling packs the soil and cuts the sod. Because of their silty texture and slowly permeable substratum, these soils are best drained by intercepting runoff from surrounding uplands; by using field ditches for surface drainage in the nearly level areas; and by smoothing, grading, or bedding the fields. In drained areas, the response to lime and fertilizer is good.

CAPABILITY UNIT IIw-5

This unit consists of deep, moderately well drained soils of the Ninigret and Tisbury series. These soils formed in water-sorted or windblown desposits and are underlain by sand and gravel or by layers of silt and very fine sand. They are nearly level to gently sloping and are slightly to moderately eroded. The water table is within 2 feet of the surface in spring and late in fall.

In the Ninigret soils, the underlying silty material is moderately slowly or slowly permeable. Otherwise, the soils of this unit are moderately rapidly to very rapidly permeable and are high to moderate in moisture-holding capacity. They are low in organic-matter content and are very strongly acid or extremely acid.

The high water table keeps these soils saturated in spring, in fall, and during prolonged rainy periods. It limits their use, especially in spring, unless drains are installed. Drained areas can be used for vegetables, silage corn, and other crops generally grown in the county. Undrained areas are suitable for hay and pasture.

In sloping fields, rows should be arranged to improve drainage and control erosion. Diversions and grassed waterways are needed in some places. Plowing when these soils are wet hastens the development of a plowsole. Cultivated areas need to be carefully managed to maintain the organic-matter content and to preserve good tilth.

In nearly level drained areas, a suitable cropping system consists of 2 years of a row crop and 2 years of grass or of a mixture of grasses and legumes. In gently sloping

drained areas, a suitable cropping system consists of 2 years of a row crop and 1 year of a green-manure crop. A winter cover crop should follow the first year of a row crop. Fertilization is necessary for good yields.

CAPABILITY UNIT IIs-8

This unit consists of deep, somewhat excessively drained soils of the Merrimac series. These soils formed in stratified, water-sorted sand and gravel and are underlain at a depth of 18 to 24 inches by coarse material. They are nearly level to gently sloping and are slightly to moderately eroded.

The soils of this unit are very rapidly to rapidly permeable and are low to moderate in moisture-holding capacity. They are low in organic-matter content and are extremely acid to strongly acid.

These soils are used mainly for hay and pasture. If irrigated, they are well suited to early vegetable crops, sweet corn, silage corn, and other crops commonly grown in the county. Although somewhat droughty, they warm up early in spring and are easy to work. The response to fertilization is good.

These soils can be farmed intensively if conservation measures are taken to control erosion in sloping areas. Suitable measures include contour cultivation, diversions, and grassed waterways. Good management is needed to increase the organic-matter content and to preserve good tilth.

A suitable cropping system consists of 2 years of a row crop and 1 year of a green-manure crop. A winter cover crop should follow the first year of a row crop. On gently sloping soils, the row crop should be grown on the contour. Good yields can be expected if these soils are irrigated and if lime and fertilizer are applied frequently in amounts indicated by soil tests.

CAPABILITY UNIT IIIe-2

This unit consists of deep, well-drained soils of the Bernardston and Essex series. These soils formed in compact glacial till. They are strongly sloping and are moderately eroded. A compact layer, or fragipan, at a depth of 24 to 30 inches restricts the growth of plant roots.

The soils of this unit are moderately to very rapidly permeable above the fragipan and are moderately slowly to slowly permeable within the fragipan. They are moderate to high in moisture-holding capacity, are low in organic-matter content, and are extremely acid to strongly acid.

These soils are suitable for hay, pasture, orchards, and woodland. Although small acreages are used for silage corn and other crops, the risk of erosion limits the use of these soils for cultivated crops. Conservation measures to control erosion include contour stripcropping, diversions, and grassed waterways. The response to lime and fertilizer is good.

In fields where conservation measures include diversions and strips on diversion grades, a suitable cropping system consists of 2 years of a row crop and 3 years of grass or of a mixture of grasses and legumes. A winter cover crop should follow the first year of a row crop. The row crop should be grown in contour strips, alternated with strips of grass or of grasses and legumes.

CAPABILITY UNIT IIIe-3

Gloucester fine sandy loam, firm substratum, 8 to 15 percent slopes, is the only soil in this unit. This is a deep, well-drained soil that formed in coarse-textured glacial till. It is strongly sloping and is moderately eroded.

Permeability is very rapid to rapid in the solum and moderately slow to slow in the firm substratum, at a depth of 2½ to 5 feet. The moisture-holding capacity is moderate to low, the organic-matter content is low, and the reaction is extremely acid or very strongly acid.

This soil is suited to most crops grown in the county. If adequately limed and fertilized, it is suitable for alfalfa. Row crows generally need irrigation.

Because of the slope, moderately intensive conservation measures are needed to control erosion. These measures include a suitable cropping system, winter cover crops, contour stripcropping, strip reseeding, grassed waterways, and diversions. A suitable cropping system consists of 2 years of a row crop and 2 years of grass or of a mixture of grasses and legumes. A winter cover crop should follow the first year of a row crop. The row crop should be grown in contour strips, alternated with strips of grass or of grasses and legumes. The response to lime and fertilizer is good.

CAPABILITY UNIT IIIe-5

This unit consists of deep, well-drained soils of the Enfield, Merrimac, and Warwick series. These soils formed in water-sorted or windblown deposits, 20 to 30 inches thick, and are underlain by sand and gravel. They are strongly sloping and are moderately eroded.

The soils of this unit are moderately to moderately rapidly permeable in the solum and rapidly permeable in the substratum. They are moderate to high in moisture-holding capacity, low in organic-matter content, and very strongly acid.

These soils are suited to most of the crops grown in the county, but they are used mainly for hay, pasture, and woodland. If adequately limed and fertilized, they are suitable for alfalfa.

Because of the strong slope, moderately intensive conservation measures are needed in cultivated fields. Such measures include a suitable cropping system, winter cover crops, contour stripcropping, contour strip seeding, grassed waterways, and diversions.

A suitable cropping system for the Enfield soils consists of 1 year of a row crop and 3 years of grass or of a mixture of grasses and legumes. A suitable cropping system for the Merrimac and Warwick soils consists of 2 years of a row crop and 1 year of a green-manure crop. A winter cover crop should follow the first year of a row crop. All row crops should be grown in contour strips alternated with strips of grass or of grasses and legumes.

The response to lime and fertilizer is favorable.

CAPABILITY UNIT IIIe-8

Merrimac sandy loam, 8 to 15 percent slopes, is the only soil in this unit. This is a deep, somewhat excessively drained soil that formed in water-deposited, stratified sand and gravel. It is moderately eroded.

This soil is very rapidly to rapidly permeable in the solum and very rapidly permeable in the sandy and gravelly substratum. It is low to moderate in moisture-holding capacity, low in organic-matter content, and extremely acid or very strongly acid.

This soil is droughty. Consequently, it needs to be irrigated to be productive. It is suited to early market garden crops but is better suited to hay and pasture or to woodland.

If row crops are grown, moderately intensive conservation measures are needed to control erosion. These measures include a suitable cropping system, winter cover crops, contour stripcropping, strip reseeding, and diversions.

A suitable cropping system consists of 2 years of a row crop and 3 years of grass or of a mixture of grasses and legumes. A winter cover crop should follow the first year of a row crop. The row crop should be grown in contour strips, alternated with strips of grass or of grasses and legumes. Regular additions of lime, fertilizer, and organic matter are required for satisfactory yields.

CAPABILITY UNIT IIIw-5

This unit consists of deep, poorly drained soils of the Raynham and Walpole series. These soils formed in water-deposited material and are underlain at a depth of 12 to 20 inches by silt or very fine sand. They are nearly level and are only slightly eroded.

Because the water table is high, the soils of this unit are wet for 7 to 9 months during the year. The Raynham soil is slowly permeable below the surface layer and is high in moisture-holding capacity. The Walpole soil is rapidly permeable in the upper part and slowly permeable in the underlying silty material. It is moderate in moisture-holding capacity. These soils are moderate in organic-matter content and are extremely acid to strongly acid.

The high water table limits the use of these soils. Undrained areas are mainly in native pasture or woodland, or they are idle. If these soils are artificially drained and are protected from runoff and seepage, they can be used for row crops, hay, and improved pasture.

If outlets are available, these soils can be drained by ditches with protected banks or by tile drainage systems. Land smoothing will eliminate low wet spots and improve surface drainage. In addition to drainage, desirable management measures include (1) using a suitable cropping system, (2) planting suitable species, (3) applying lime and fertilizer in amounts determined by soil tests, (4) keeping machinery and animals off fields during wet periods, (5) planting water-tolerant grasses and legumes for pasture or hay, and (6) arranging rows so as to improve drainage.

Because these soils are underlain by slowly permeable silt and very fine sand, they are somewhat more difficult to drain than soils that have a sandy and gravelly substratum.

In drained areas of the Raynham soil, a suitable cropping system consists of 2 years of a row crop and 1 year of a green-manure crop. A winter cover crop should follow the first year of a row crop. Drained areas of the Walpole soil can be used continuously for row crops followed each year by a winter cover crop.

CAPABILITY UNIT IIIw-9

This unit consists of deep, moderately well drained soils of the Deerfield series. These soils formed in sand deposited by water or wind. They are nearly level to gently sloping and are slightly to moderately eroded.

The soils of this unit are rapidly or very rapidly permeable and are low to moderate in moisture-holding capacity. They contain only a small amount of organic matter, and they are very strongly acid or strongly acid.

A high water table keeps these soils saturated until late in spring. Nevertheless, because of their coarse texture and low moisture-holding capacity, they commonly are droughty during the summer.

Undrained areas are suitable for hay and pasture. Drained areas can be used for early truck crops or silage corn.

Irrigation generally is beneficial. In irrigated areas, the response to lime and fertilizer is good. Lime and fertilizer are readily leached, however, and frequent applications are necessary. Green-manure crops improve tilth and increase the capacity of the soils to retain moisture and plant nutrients.

A suitable cropping system in drained areas consists of continuous row crops followed by winter cover crops. Gently sloping areas need to be cultivated on the contour for control of erosion.

CAPABILITY UNIT IIIs-9

This unit consists of excessively drained soils of the Hinckley, Quonset, and Windsor series and of somewhat excessively drained soils of the Gloucester series. These soils formed in coarse, sandy glacial till; in water-sorted sand; or in stratified sand and gravel. They are nearly level to gently sloping and are slightly to moderately eroded.

The soils of this unit are rapidly or very rapidly permeable. They are low in moisture-holding capacity, and they are medium acid to very strongly acid.

These soils are limited in suitability for crops, hay, and pasture because they are droughty and are very low in natural fertility. They warm up early in spring, however, and they respond to fertilization if the moisture supply is adequate. For these reasons, they are used for sweet corn and other truck crops. If adequately limed and fertilized, they are well suited to alfalfa.

If these soils are used for cultivated crops, careful management is needed to improve fertility and to maintain or increase the organic-matter content. Cultivated crops require heavy and frequent fertilization and irrigation.

A good cropping system for the Gloucester, Hinckley, and Quonset soils consists of 2 years of a row crop and 1 year of a green-manure crop in nearly level areas, and 2 years of a row crop and 2 years of grass or of a mixture of grasses and legumes in gently sloping areas. A winter cover crop should follow the first year of a row crop. In gently sloping areas, the row crop should be grown on the contour.

A suitable cropping system for the Windsor soils consists of continuous row crops followed each year by a winter cover crop. In gently sloping areas, the row crop should be grown on the contour. Fertilizer and lime leach out rapidly.

CAPABILITY UNIT IVe-8

Merrimac sandy loam, 15 to 35 percent slopes, is the only soil in this unit. This is a deep, somewhat excessively drained soil that formed in water-sorted sand and gravel. It is underlain at a depth of about 24 inches by stratified sand and gravel. It is moderately eroded.

This soil is very rapidly to rapidly permeable, and it is low to moderate in moisture-holding capacity. The organic-matter content is low, and the reaction is extremely acid to strongly acid.

Because the hazard of erosion is severe, this soil is better suited to hay, pasture, or woodland than to cultivated crops. Corn or some other row crop can be grown in the process of renovating a hayfield or pasture.

Intensive conservation measures needed to control erosion include stripcropping, strip reseeding, grassed waterways, and diversions. Areas used for hay and pasture should be reseeded in strips. Organic matter, added regularly in the form of manure or crop residues, helps to maintain good tilth. If the moisture supply is sufficient, the response to lime and fertilizer is favorable.

If diversions and strips on diversion grades are used, a suitable cropping system consists of 1 year of a row crop and 3 years of grass or of a mixture of grasses and legumes. The row crop should be grown in strips alternated with strips of grass or of grasses and legumes.

CAPABILITY UNIT IVw-9

This unit consists of poorly drained, nearly level or gently sloping soils of the Au Gres, Norwell, and Wareham series. These soils formed in sandy glacial till or in water-sorted sand. They have a high water table, and they receive runoff from surrounding higher soils. Consequently, they are saturated for 7 to 9 months during the year. The Norwell soils have a moderately slowly or slowly permeable fragipan at a depth of 15 to 24 inches.

The soils of this unit are extremely acid to strongly acid. Their surface layer is high in organic-matter content.

These soils are suitable for cultivated crops only if they are drained. They are suitable for moisture-tolerant legumes and grasses if they are limed, fertilized, and otherwise well managed. If pastures are grazed when wet, trampling damages the sod.

CAPABILITY UNIT IVs-9

This unit consists of excessively drained soils of the Carver, Hinckley, Quonset, and Windsor series and of somewhat excessively drained soils of the Gloucester series. These soils formed in sand or in stratified sand and gravel. They are nearly level to strongly sloping and are slightly to moderately eroded.

The soils of this unit are rapidly or very rapidly permeable and are very low to low in moisture-holding capacity. They are very low in organic-matter content and are very strongly acid to medium acid.

These soils dry out early in spring and are droughty. Most areas are in scrubby forest or are idle. A few improved areas are used for hay, pasture, silage corn, early vegetables, and other specialty crops. If irrigated, these soils respond well to lime and fertilizer and can be used for the crops commonly grown in the county. They are readily leached of plant nutrients, however, and organic matter is quickly depleted. Therefore, frequent applications of commercial fertilizers and of manure or crop residues are needed.

Unprotected slopes are subject to both wind and water erosion. Sloping fields should be cultivated on the contour or in strips. Grassed waterways and diversions are also needed to help control erosion.

A suitable cropping system for the Carver soils consists of continuous row crops followed each year by a winter cover crop. The row crop should be grown on the contour on gently sloping Carver soils. A suitable system for the other soils of this unit consists of 2 years of a row crop and 1 year of a green-manure crop. A winter cover crop should follow the first year of a row crop. The row crop should be grown in contour strips alternated with strips of a green-manure crop.

CAPABILITY UNIT Vw-2

Brockton loam, 0 to 3 percent slopes, is the only soil in this unit. This is a very poorly drained soil that formed in sandy glacial till. It occupies nearly level areas or depressions. In most places it is underlain at a depth of 12 to 24 inches by compact till.

This soil is rapidly permeable above the compact till and slowly permeable within the compact till. It is low to moderate in moisture-holding capacity, high in organic-matter content, and extremely acid or very strongly acid.

Excess water severely limits the use of this soil for cultivated crops. Most areas are wooded or are idle. A few areas have been drained and are used as pasture or hayfields.

In most places this soil is difficult to drain because of the lack of suitable outlets. If outlets are available, it can be drained by ditches that have protected banks. It does not drain well into tile.

Good management of drained areas consists of planting moisture-tolerant species, applying lime and fertilizer as needed, and keeping machinery and animals off wet fields.

CAPABILITY UNIT Vw-5

This unit consists of very poorly drained soils of the Scarboro series. These soils formed in sand or in sand and gravel. They occupy depressions or low flat areas and are saturated most of the year because the water table is high.

In places these soils are underlain by moderately slowly permeable silt and very fine sand. Otherwise, they are very rapidly to moderately rapidly permeable below the surface layer. They are high in organic-matter content, and they are extremely acid or very strongly acid.

Excess water limits the use of these soils to unimproved pasture or woodland. Drainage is difficult because of the lack of suitable outlets. If suitable outlets are available, these soils can be drained by ditches with protected banks or by a tile drainage system. They can then be seeded and managed for improved pasture. Small areas that are drained and otherwise well managed are suited to specialty crops. Crops respond to lime and fertilizer.

CAPABILITY UNIT Vs-22

Scituate very stony sandy loam, 0 to 3 percent slopes, is the only soil in this unit. This is a deep, very stony, moderately well drained soil that formed in compact glacial till. It has a compact layer, or fragipan, at a depth of 18 to 30 inches. Many stones and boulders occur on the surface and throughout the soil material. Generally, this soil is saturated from late in fall to late in spring and during other prolonged rainy periods.

Permeability is moderately rapid to very rapid above the fragipan but slow to moderately slow within the fragipan. This soil is moderate to low in moisture-holding capacity, moderate in organic-matter content, and very strongly acid or strongly acid.

Some areas are used for unimproved pasture, but stoniness and excessive moisture limit the use of this soil mainly to woodland.

CAPABILITY UNIT VIw-4

Birdsall silt loam, 0 to 3 percent slopes, is the only soil in this unit. This is a very poorly drained soil that formed in deep deposits of silt and very fine sand. It occupies depressions or low flat areas. Runoff from higher surrounding areas collects on this soil, and the water table is high. Consequently, water stands on or near the surface during most of the year.

This soil is underlain by slowly permeable or moderately slowly permeable material. It is high in moisture-holding capacity, and it is very strongly acid.

Excess water severely limits the use of this soil for crops or pasture. Most areas are in forest and brushy unimproved pasture, or they are idle.

To drain this soil sufficiently to make it suitable for cultivated crops generally is not practical, because of the slowly permeable underlying material and the lack of suitable oulets. Some areas can be drained by open ditches and made suitable for improved pasture. Undrained areas are suitable for woodland, unimproved pasture, and wildlife habitat.

CAPABILITY UNIT VIw-6

Saco very fine sandy loam is the only soil in this unit. This is a nearly level, very poorly drained soil that formed in silty and fine sandy alluvial deposits. It occupies low areas along sluggish streams and is subject to frequent flooding.

Permeability is moderate in the solum and moderately slow to very rapid in the substratum. The organic-matter content is high, and the reaction is very strongly acid or strongly acid.

Wetness and flooding limit the use of this soil mainly to woodland, unimproved pasture, and wildlife habitat.

Drainage generally is not practical, because of the lack of suitable outlets and the hazard of frequent flooding. There are a few small areas that have been drained and are protected well enough to be used for unimproved pasture. In places, pasture can be improved by applying fertilizer and clipping weeds.

CAPABILITY UNIT VIs-2

This unit consists of deep, well-drained soils of the Bernardston and Essex series. These soils formed in compact glacial till. They are gently sloping to moderately steep and are slightly eroded. There is a compact layer, or fragipan, at a depth of 24 to 30 inches. Many stones and boulders occur on and below the surface.

Above the fragipan, these soils are moderately to very rapidly permeable and are moderate to high in moisture-holding capacity. The fragipan is moderately slowly to slowly permeable and is low in moisture-holding capacity. It restricts the vertical movement of water and the growth of roots. The reaction is strongly acid to extremely acid, and the organic-matter content is low.

Stoniness limits the use of these soils for row crops, but they are suitable for pasture, orchards, or woodland. Areas that are used for improved pasture require management and regular additions of lime and fertilizer.

CAPABILITY UNIT VIs-7

This unit consists of gently sloping to strongly sloping, very rocky, well-drained to somewhat excessively drained soils of the Charlton, Hollis, and Warwick series. These soils formed in glacial till over bedrock. The depth to bedrock generally is less than 20 inches but in some places is more than 3 feet. Many stones and boulders are on the surface, and there are numerous outcrops of bedrock.

The soils of this unit are moderately to rapidly permeable. They are low to moderate in moisture-holding capacity, low in organic-matter content, and extremely acid to strongly acid.

Extreme rockiness limits the use of these soils to unimproved pasture, woodland, and wildlife habitat. Most of the acreage is wooded.

CAPABILITY UNIT VIs-8

This unit consists of deep, well-drained and somewhat excessively drained, very stony soils of the Gloucester series. These soils formed in glacial till. They are gently sloping to moderately steep and are slightly eroded. There are many stones and boulders on the surface and throughout the soil material.

In some places these soils are moderately rapidly to very rapidly permeable throughout, and in others they are underlain below a depth of 30 inches by a firm, slowly permeable or moderately slowly permeable substratum. They are moderate or low in moisture-holding capacity, and they are mainly very strongly acid and low in organic-matter content.

These soils are not used for row crops, because stones and boulders prevent tillage. They are used mainly for unimproved pasture, orchards, and woodland. They produce good pasture if limed and fertilized. Some of the less sloping areas can be cleared of stones and used for crops or hay.

CAPABILITY UNIT VIs-22

This unit consists of deep, gently to strongly sloping, very stony, moderately well drained soils of the Pittstown and Scituate series. These soils formed in glacial till. They are saturated in spring and late in fall because they receive runoff and seepage water from adjoining soils or have a high water table. Natural drainage is impeded by a compact layer, or fragipan, which is within 30 inches of the surface. Numerous stones and boulders occur on the surface and throughout the soil material.

These soils are moderately to rapidly permeable in the solum and moderately slowly to slowly permeable in the substratum. They are moderate to high in moisture-holding capacity, low in organic-matter content, and mainly very strongly acid.

The combination of surface stones, boulders, and wetness limits the use of these soils to unimproved pasture and woodland. In some of the more nearly level, less stony areas, pastures can be improved by the use of lime and fertilizer.

CAPABILITY UNIT VIIw-1

This unit consists of Muck and Peat. These soils are saturated or flooded most of the time.

With special preparation, the soils of this unit can be developed for cranberry production. Otherwise, they are limited in use to habitat for wetland wildlife.

CAPABILITY UNIT VIIs-2

This unit consists of nearly level to steep, extremely stony, well drained and moderately well drained soils of the Essex, Gloucester, and Scituate series. These soils formed in loose or compact glacial till. They have a mod-

erately rapidly permeable or very rapidly permeable solum and are low to moderate in moisture-holding capacity.

These soils are severely limited in use by stoniness and to some extent by steep slopes. Most areas are forested. Small scattered areas have been cleared and used for unimproved pasture of low carrying capacity (fig. 7), or they are idle. These soils are suitable for wildlife habitat and woodland.

CAPABILITY UNIT VIIs–7

This unit consists of extremely rocky, gently sloping to moderately steep, well-drained and excessively drained soils of the Charlton and Hollis series. These soils formed in thin deposits of glacial till over bedrock. They are droughty because of shallowness. In most places bedrock is at a depth of less than 20 inches, but in places it is at a depth of 3 feet or more. Outcrops of bedrock are generally 30 feet apart or less.

These soils are moderately to rapidly permeable. They are mainly extremely acid to strongly acid.

Extreme rockiness limits the use of these soils to woodland, wildlife habitat, or recreation areas. Most of the acreage is wooded. In well-managed woodlands, the growth of desirable trees is encouraged by weeding, selective cutting, and interplanting. Improved wildlife habitat is a by-product of good woodland management.

CAPABILITY UNIT VIIs–9

This unit consists of excessively drained soils of the Carver, Hinckley, Quonset, and Windsor series and of somewhat excessively drained soils of the Gloucester series. These soils formed in deep sand, sand and gravel, or coarse sandy glacial till. They are level to steep and are slightly or moderately eroded.

The soils in this unit are very rapidly and rapidly permeable and are very low to low in moisture-holding capacity. They are very low in organic-matter content and are very strongly acid or extremely acid.

These soils are severely limited in use because of droughtiness. The Carver soils are further limited because of their coarse texture. The Windsor soils are subject to wind erosion unless protected by vegetation.

Woodland and wildlife habitat are suitable uses for these soils. Most of the acreage is in scrubby woodland of pitch pine and scrub oak that is periodically burned over.

Figure 7.—Unimproved pasture on Essex extremely stony coarse sandy loam.

CAPABILITY UNIT VIIs-23

This unit consists of poorly drained, level to gently sloping, extremely stony soils of the Norwell series. These soils formed in compact glacial till. Numerous stones and boulders are on the surface. A compact layer, or fragipan, at a depth of 15 to 24 inches restricts internal drainage.

These soils are saturated for 7 to 9 months each year. They are rapidly or very rapidly permeable above the fragipan and slowly or moderately slowly permeable within the fragipan. They are moderate to low in moisture-holding capacity, moderate to high in organic-matter content, and very strongly acid.

The soils of this unit are too wet and too stony to be suited to crops or improved pasture. Most of the acreage is in cutover woodland. Some areas have been cleared or partly cleared and used for unimproved pasture. Unimproved pasture consisting of native grasses provides fair grazing, especially during dry periods. Other suitable uses for these soils are woodland and wildlife habitat.

CAPABILITY UNIT VIIs-24

Brockton extremely stony loam, 0 to 3 percent slopes, is the only soil in this unit. This is a very poorly drained soil that formed in compact glacial till. It occurs in depressions and is saturated most of the year. In most places it has a slowly permeable compact layer at a depth of 12 to 24 inches.

This soil is high in organic-matter content and is extremely acid or very strongly acid.

Most of the acreage is in a forest of red maple. A few small cleared areas are used for unimproved pasture. They provide fair grazing during dry periods. This soil is too stony and wet to be suited to crops or improved pasture. The most practical use is wildlife habitat.

CAPABILITY UNIT VIIIw-1

This unit consists of areas of Fresh water marsh and Tidal marsh. These areas are either continually or regularly flooded. Fresh water marsh supports prolific aquatic vegetation and contains little open water. Tidal marsh contains both organic and mineral material and is regularly flooded by salt or brackish water.

These areas of marsh provide habitat for waterfowl and certain wetland mammals.

CAPABILITY UNIT VIIIs-2

Dune land and Coastal beach make up this unit. These areas consist of unstable and partially stable sand adjacent to the shoreline.

Coastal beach consists of wave-washed and sorted sand that is affected by tidal action. Such areas are subject to erosion or accretion by tidal currents, wave action, and storms. Small areas consist of uniform-sized gravel.

Dunes formed from beach sand redeposited by wind in a characteristic billowy topography. Some dunes are partially stabilized by a cover of beachgrass, regosa rose, beach plum, and bayberry.

These areas are a valuable recreational asset to the county. Some areas provide habitat for wildlife.

Estimated yields

Table 1, page 18, lists the estimated average annual yields of the principal field and pasture crops grown in Plymouth County. The yields are estimated for two levels of management.

Estimates of yields are given only for the soils that are normally used for field and pasture crops. Many soils cannot be used, because of poor natural drainage, stoniness or rockiness, or some other adverse condition.

Also, no estimates are shown for cranberries, the principal crop grown in the county. Soils on which cranberries are grown must be especially prepared. The acreage that has been developed for this purpose is mapped as Sanded muck (Sb).

The estimates shown in table 1 are averages that can be expected over several years. Yields in any 1 year may be affected by many factors, including weather, insects, and plant diseases. Several years of improved management may be necessary before higher yields are obtained consistently.

The figures in columns A represent yields to be expected under a low level of management. Under such management, one or more of the practices required to obtain yields in columns B are not carried out. The practices at the B level of management are explained in the following paragraph.

The figures in columns B represent yields to be expected under a moderately high level of management. These estimates are based on yields obtained by farmers in the county and on yields reported from experimental plots on some of the soils. The higher yields of crops are obtained by (1) applying lime, manure, and commercial fertilizer in adequate amounts; (2) using suitable cropping systems and managing crop residue properly; (3) draining if necessary; (4) controlling runoff and erosion; (5) controlling weeds, insects, and plant diseases; (6) preparing seedbeds properly; and (7) selecting suitable crops and varieties. Pasture is improved by (1) fertilizing and liming, (2) controlling brush and weeds, and (3) seeding desirable forage mixtures.

Use of Soils for Community Development

In this subsection the soils are rated according to their limitations for use for (1) septic-tank systems, (2) homesites, (3) school sites, and (4) sites for athletic fields or intensive play areas. The ratings are given in table 2.

Plymouth County is essentially rural, but recent growth in population is rapidly changing its character. This is especially true in the northern part of the county where residential, commercial, and industrial expansion has been greatest. The need for homes, shopping centers, schools, factories, and similar facilities is resulting in intense competition for land, and much of the better agricultural land has been converted to nonagricultural use. Indications are that the southern part of the county will have the same pattern of changes in land use.

As a rule, soils that are the best for agriculture are also best for other uses. Consequently, a land-use plan is needed to reserve areas of productive soils for agriculture. The information in this subsection is helpful in planning land use. It can be used by many persons and agencies concerned with community development.

Town planning boards, planning consultants, and others who need more detailed information about soils as sites for residential, commercial, industrial, and school facilities and for recreation and other community uses can also

refer to the section "Descriptions of Soils" and to the photo-base maps at the back of this survey.

Regional planners and those who are interested in soils from a broad viewpoint can refer to the section "General Soil Map."

Table 2, page 21, shows the soil-related limitations that influence the installation and functioning of septic tanks and the development of sites for homes, schools, and athletic fields. These limitations are rated as *slight*, *moderate*, *severe*, or *very severe*. Slight indicates that no special problems are expected. Standard design criteria and construction methods generally give satisfactory results. Moderate indicates that the soil is generally satisfactory for the purpose specified but that development, construction, or maintenance costs commonly are greater than on soils that have slight limitations. Commonly, special care is required in draining, grading, stabilizing, and landscaping. Severe indicates that intensive corrective measures are required to overcome soil limitations. Costs of development, construction, or maintenance are excessive. Very severe indicates the soil has properties that generally preclude its use for the purpose specified without major and extremely costly corrective measures.

Only the properties of the soils were considered in making these ratings. Not considered were the size of soil areas, local sanitation requirements, transportation facilities, location of a site in relation to community centers, and other economic factors. These factors are important, and they may outweigh soil properties when decisions have to be made as to whether a soil should be used for a specific purpose. The location of streams, communities, railroad tracks, and roads can be observed on the photo-base maps at the back of this survey.

The ratings shown in table 2 are based partly on field observations and experience and partly on data from laboratory and field research. They can be used as guides in locating sites for development. The information in this survey, however, is not a substitute for onsite investigation of specific tracts of land to be developed for a given use. The rating for any given site may differ from the rating given in table 2 because of local variations that were not practical to show on the soil map. These variations are called mapping inclusions. Some of the more significant inclusions are mentioned in the mapping unit descriptions in the section "Descriptions of Soils."

In the following paragraphs, the limitations rated in table 2 are explained.

Limitations of soils for septic-tank systems

Residential areas have expanded into rural communities beyond existing sewer lines, thus necessitating individual sewage disposal systems. Sewage is commonly disposed of in these individual systems by means of septic tanks. There are several choices in the construction of septic-tank systems, and thorough investigation is necessary to determine which is best for a specific site.

The location of a septic-tank system and the size of the tank and the disposal area are determined largely by the volume of effluent and the rate at which its moves through the soil. Not only soil properties have to be considered, but also the sanitary code, housing density, size and shape of the lot, water supply, and the possible need for expanding the disposal system.

Many soils have properties that severely limit individual disposal systems regardless of the size of the septic tank or the disposal area. A slow percolation rate or a high water table causes a majority of septic-tank failures. Failures are also caused by faulty installation or improper use and maintenance.

The main factors considered in rating limitations for septic-tank systems are permeability below a depth of 30 inches, hazard of flooding, depth to bedrock, depth to a temporary (seasonal) or relatively permanent high water table, slope, surface rockiness (ledginess), and surface stoniness.

Limitations of soils for homesites

The main factors considered in rating limitations for homesites are depth to a temporary (seasonal) or relatively permanent high water table, periodic flooding, slope, surface rockiness (ledginess), depth to bedrock, depth to a slowly permeable layer, surface stoniness in relation to landscaping, and texture of the surface soil in relation to establishment and maintenance of lawns and shrubs.

The degree of limitation is based on the assumption that the houses will have one or two stories and a 7-foot cellar. Normally, the ceiling of the cellar is about 2 feet above the ground surface. The limitation for individual sewage disposal systems is not considered.

Limitations of soils for school sites

The increasing population in many communities has resulted in a need for new or enlarged school facilities. This survey provides information that can be used in deciding on the location of school sites. The degree of limitation is based on the assumption that the school buildings will not have a basement. Not considered are the location, size, and shape of the site and the limitations of the soils for sewage disposal.

The main factors considered in rating limitations for school sites are the hazard of flooding, depth to bedrock or to a slowly permeable layer, depth to a temporary (seasonal) or relatively permanent high water table, surface rockiness (ledginess), slope in relation to land leveling, and surface stoniness in relation to landscaping.

Limitations of soils for athletic fields

The main factors considered in rating limitations for athletic fields are slope, surface rockiness (ledginess), depth to bedrock, depth to a temporary (seasonal) or relatively permanent high water table, permeability within 30 inches of the surface, texture of the surface layer, and surface stoniness. These limitations also apply to playgrounds and other recreation areas that are used intensively.

Use of Soils for Engineering Purposes [1]

Some soil properties are of special interest to engineers, contractors, and others involved in the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. The soil properties most important in engineering and construction are permeability, shear strength, compaction

[1] Prepared with the assistance of MILES J. HUBLER, engineering specialist, Soil Conservation Service.

TABLE 1.--ESTIMATED AVERAGE ACRE YIELDS OF FIELD CROPS AND PASTURE CROPS UNDER TWO LEVELS OF MANAGEMENT

[Yields in columns A are those expected under a low level of management; those in columns B, under a moderately high level of management. Absence of yields indicates crop is not usually grown on the soil. Only the soils suitable for field and pasture crops are listed. Cranberries, the principal crop, are grown mainly on Sanded muck (Sb), which is not used for other crops]

Soil	Sweet corn		Silage corn		Hay				Pasture 1/ (tall grass-legume)	
					Alfalfa-grass		Clover-grass			
	A	B	A	B	A	B	A	B	A	B
	Bu. 2/	Bu. 2/	Tons	Tons	Tons	Tons	Tons	Tons	Cow-acre-days 3/	Cow-acre-days 3/
Agawam fine sandy loam, 0 to 3 percent slopes	175	275	10	16	2.5	4.0	2.0	3.0	120	230
Agawam fine sandy loam, 3 to 8 percent slopes	175	275	10	16	2.5	4.0	2.0	3.0	120	230
Agawam fine sandy loam, silty subsoil variant, 0 to 3 percent slopes	175	300	12	18	2.5	4.0	2.0	3.5	130	230
Agawam fine sandy loam, silty subsoil variant, 3 to 8 percent slopes	175	300	12	18	2.5	4.0	2.0	3.5	130	230
Au Gres and Wareham loamy sands, 0 to 3 percent slopes	---	---	--	--	---	---	2.0	3.5	70	200
Au Gres and Wareham loamy sands, 3 to 8 percent slopes	---	---	--	--	---	---	2.0	3.5	70	200
Belgrade silt loam, 0 to 3 percent slopes	125	225	10	15	2.0	3.5	2.5	4.0	120	230
Belgrade silt loam, 3 to 8 percent slopes	125	225	10	15	2.0	3.5	2.5	4.0	120	230
Bernardston silt loam, 3 to 8 percent slopes	---	---	15	20	2.5	4.5	2.5	4.0	150	255
Bernardston silt loam, 8 to 15 percent slopes	---	---	15	20	2.5	4.5	2.5	4.0	150	255
Carver loamy coarse sand, 0 to 3 percent slopes	---	150	6	10	1.5	3.0	1.0	2.0	60	170
Carver loamy coarse sand, 3 to 8 percent slopes	---	150	6	10	1.5	3.0	1.0	2.0	60	170
Deerfield sandy loam, 0 to 3 percent slopes	100	200	8	12	2.0	3.5	2.5	3.0	80	200
Deerfield sandy loam, 3 to 8 percent slopes	100	200	8	12	2.0	3.5	2.5	3.0	80	200
Enfield very fine sandy loam, 0 to 3 percent slopes	175	300	14	20	3.0	4.5	2.5	3.5	150	255
Enfield very fine sandy loam, 3 to 8 percent slopes	175	300	14	20	3.0	4.5	2.5	3.5	150	255
Enfield very fine sandy loam, 8 to 15 percent slopes	125	250	10	17	3.0	4.5	2.5	3.5	150	255
Essex coarse sandy loam, 0 to 3 percent slopes	150	250	12	18	2.5	4.0	2.5	3.0	120	230
Essex coarse sandy loam, 3 to 8 percent slopes	150	250	12	18	2.5	4.0	2.5	3.0	120	230

Essex coarse sandy loam, 8 to 15 percent slopes	125	225	10	16	2.5	4.0	2.5	3.0	120	230
Gloucester fine sandy loam, firm substratum, 0 to 3 percent slopes	175	275	10	15	2.5	4.0	2.0	3.0	120	230
Gloucester fine sandy loam, firm substratum, 3 to 8 percent slopes	175	275	10	15	2.5	4.0	2.0	3.0	120	230
Gloucester fine sandy loam, firm substratum, 8 to 15 percent slopes	150	250	9	14	2.5	4.0	2.0	3.0	100	210
Gloucester loamy sand, 0 to 3 percent slopes	100	200	8	12	2.0	3.5	1.5	2.5	60	200
Gloucester loamy sand, 3 to 8 percent slopes	100	200	8	12	2.0	3.5	1.5	2.5	60	200
Gloucester loamy sand, 8 to 15 percent slopes	---	---	--	--	2.0	3.0	1.5	2.5	50	180
Hinckley gravelly loamy sand, 0 to 3 percent slopes	100	200	6	10	1.5	3.0	1.0	2.0	60	170
Hinckley gravelly loamy sand, 3 to 8 percent slopes	100	200	6	10	1.5	3.0	1.0	2.0	60	170
Hinckley gravelly loamy sand, 8 to 15 percent slopes	---	---	6	10	1.5	3.0	1.0	2.0	60	170
Hollis-Charlton fine sandy loams, 3 to 8 percent slopes	---	---	8	14	2.0	3.5	2.0	3.0	120	200
Merrimac fine sandy loam, 0 to 3 percent slopes	175	275	12	18	2.5	4.0	2.0	3.0	120	230
Merrimac fine sandy loam, 3 to 8 percent slopes	175	275	12	18	2.5	4.0	2.0	3.0	120	230
Merrimac fine sandy loam, 8 to 15 percent slopes	125	225	12	18	2.5	4.0	2.0	3.0	90	200
Merrimac sandy loam, 0 to 3 percent slopes	125	225	9	14	2.0	3.5	1.5	2.5	90	200
Merrimac sandy loam, 3 to 8 percent slopes	125	225	9	14	2.0	3.5	1.5	2.5	90	200
Merrimac sandy loam, 8 to 15 percent slopes	100	200	9	14	2.0	3.5	1.5	2.5	90	200
Ninigret sandy loam, silty subsoil variant, 0 to 3 percent slopes	150	250	10	16	2.5	3.5	2.0	3.0	120	200
Ninigret sandy loam, silty subsoil variant, 3 to 8 percent slopes	150	250	10	16	2.5	3.5	2.0	3.0	120	200
Norwell sandy loam, 0 to 3 percent slopes	---	---	--	11	---	---	1.5	3.0	90	170
Norwell sandy loam, 3 to 8 percent slopes	---	---	--	11	---	---	1.5	3.0	90	170
Pittstown silt loam, 0 to 8 percent slopes	---	---	10	15	2.0	3.5	2.5	4.0	150	230
Quonset sandy loam, 0 to 3 percent slopes	125	225	9	14	2.0	3.5	1.5	2.5	90	200
Quonset sandy loam, 3 to 8 percent slopes	125	225	9	14	2.0	3.5	1.5	2.5	90	200
Quonset sandy loam, 8 to 15 percent slopes	100	200	9	14	2.0	3.5	1.5	2.5	90	200
Raynham silt loam, 0 to 3 percent slopes	---	---	--	10	---	---	1.0	3.0	70	180
Scituate sandy loam, 0 to 3 percent slopes	125	250	10	15	2.0	3.0	2.5	4.0	150	230
Scituate sandy loam, 3 to 8 percent slopes	125	250	10	15	2.0	3.0	2.5	4.0	150	230

See footnotes at end of table.

TABLE 1.--ESTIMATED AVERAGE ACRE YIELDS OF FIELD CROPS AND PASTURE CROPS UNDER TWO LEVELS OF MANAGEMENT--CONTINUED

Soil	Sweet corn		Silage corn		Hay: Alfalfa-grass		Hay: Clover-grass		Pasture 1/ (tall grass-legume)	
	A	B	A	B	A	B	A	B	A	B
	Bu. 2/	Bu. 2/	Tons	Tons	Tons	Tons	Tons	Tons	Cow-acre-days 3/	Cow-acre-days 3/
Tisbury very fine sandy loam, 0 to 8 percent slopes	150	275	10	15	2.0	3.5	2.5	4.0	150	230
Walpole fine sandy loam, silty subsoil variant, 0 to 3 percent slopes	---	---	--	12	---	---	1.5	3.5	90	200
Warwick fine sandy loam, 0 to 3 percent slopes	175	275	12	18	2.5	4.0	2.0	3.0	120	230
Warwick fine sandy loam, 3 to 8 percent slopes	175	275	12	18	2.5	4.0	2.0	3.0	120	230
Warwick fine sandy loam, 8 to 15 percent slopes	125	225	12	18	2.5	4.0	2.0	3.0	90	200
Windsor loamy sand, 0 to 3 percent slopes	100	200	8	12	2.0	3.0	1.0	2.0	60	170
Windsor loamy sand, 3 to 8 percent slopes	100	200	8	12	2.0	3.0	1.0	2.0	60	170
Windsor loamy sand, 8 to 15 percent slopes	---	---	6	10	1.5	3.0	1.0	2.0	60	170

1/ 200-day grazing season.

2/ A bushel equals 5 dozen ears.

3/ Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for 2 cows has a carrying capacity of 60 cow-acre-days.

TABLE 2.--ESTIMATED DEGREES OF LIMITATION FOR SELECTED USES IN COMMUNITY DEVELOPMENT

Soil series and map symbols	Septic-tank fields	Homesites	School sites	Athletic fields or intensive play areas
Agawam:				
AfA	Slight 1/	Slight	Slight	Slight.
AfB	Slight 1/	Slight	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent.
AgA, AgB	Severe: Slowly permeable silty material at depth of about 36 inches.	Moderate: Slowly permeable silty material at depth of about 36 inches.	Moderate: Slowly permeable silty material at depth of about 36 inches.	Severe: Slowly permeable silty material at depth of about 36 inches.
Au Gres and Wareham: AuA, AuB.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.
Belgrade: BaA, BaB.	Severe: Excess seepage or high water table within 2 feet of surface during winter and early in spring.	Moderate: Temporary high water table or excess seepage within 2 feet of surface during winter and early in spring.	Moderate: Temporary high water table or excess seepage within 2 feet of surface during winter and early in spring.	Moderate: Temporary high water table or excess seepage within 2 feet of surface during winter and early in spring; silty texture makes trafficability a problem; some slopes of 3 to 8 percent.
Bernardston: BbB, BbC, BcB, BcD.	Severe: Slowly permeable fragipan within 2½ feet of surface; slopes of 15 to 25 percent.	Moderate: Fragipan within 2½ feet of surface; very stony surface in places.	Moderate: Fragipan within 2½ feet of surface; severe on slopes of 15 to 25 percent in places.	Severe: Fragipan within 2½ feet of surface; slopes of 15 to 25 percent in places.
Birdsall: BdA	Severe: High water table at or near surface most of the year; slowly permeable.	Severe: High water table at or near surface most of the year; ponding of surface runoff.	Severe: High water table at or near surface most of the year; ponding of surface runoff; slowly permeable.	Severe: High water table at or near surface most of the year; difficult to drain; ponding of surface runoff.
Borrow land: Bo, Br. (Properties variable; requires onsite investigation.)				

See footnote at end of table.

TABLE 2.--ESTIMATED DEGREES OF LIMITATION FOR SELECTED USES IN COMMUNITY DEVELOPMENT--CONTINUED

Soil series and map symbols	Septic-tank fields	Homesites	School sites	Athletic fields or intensive play areas
Brockton: BsA, BtA.	Severe: High water table at or near surface most of the year.	Severe: High water table at or near surface most of the year; ponding of surface runoff.	Severe: High water table at or near surface most of the year; ponding of surface runoff.	Severe: High water table at or near surface most of the year; ponding of surface runoff.
Carver:				
CaA------------	Slight 1/-----------	Moderate: Coarse texture causes some landscaping problems.	Slight--------------	Severe: Droughtiness causes difficulty in establishing and maintaining satisfactory sod.
CaB------------	Slight 1/-----------	Moderate: Coarse texture causes some landscaping problems.	Moderate: Slopes of 3 to 8 percent.	Severe: Slopes of 3 to 8 percent; droughtiness causes difficulty in establishing and maintaining sod.
CaC, CbC-------	Moderate: Slopes of 8 to 15 percent.1/	Moderate: Slopes of 8 to 15 percent.	Moderate: Slopes of 8 to 15 percent.	Severe: Slopes of 8 to 15 percent.
CaE------------	Severe: Slopes of 15 to 35 percent. 1/	Moderate on slopes of 15 to 25 percent; severe on slopes greater than 25 percent.	Severe: Slopes of 15 to 35 percent.	Severe: Slopes of 15 to 35 percent.
CbA------------	Slight 1/-----------	Slight: Droughtiness causes some landscaping problems.	Slight--------------	Moderate: Droughtiness causes difficulty in establishing and maintaining sod.
CbB------------	Slight 1/-----------	Slight: Droughtiness causes some landscaping problems.	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent; droughtiness causes difficulty in establishing and maintaining sod.
Carver and Gloucester: CcD.	Moderate on slopes of 8 to 15 percent; severe on slopes greater than 15 percent. 1/	Moderate on slopes of 8 to 25 percent; severe on slopes of 25 to 35 percent; easy to excavate, but stones and boulders in some places.	Moderate on slopes of 8 to 15 percent; severe on slopes of 15 to 35 percent.	Severe: Slopes of 8 to 35 percent.

See footnote at end of table.

TABLE 2.--ESTIMATED DEGREES OF LIMITATION FOR SELECTED USES IN COMMUNITY DEVELOPMENT--CONTINUED

Soil series and map symbols	Septic-tank fields	Homesites	School sites	Athletic fields or intensive play areas
Deerfield: DeA, DeB.	Severe: Temporary high water table within 2 feet of surface during winter and early in spring.	Moderate: Temporary high water table within 2 feet of surface during winter and early in spring.	Moderate: Temporary high water table within 1 to 2 feet of surface during winter and early in spring.	Moderate: Temporary high water table within 1 to 2 feet of surface during winter and early in spring.
Dune land and Coastal beach: Du.	Very severe---------	Very severe---------	Very severe---------	Very severe.
Enfield:				
EnA------------	Slight 1/-----------	Slight--------------	Slight--------------	Slight: Slopes of 0 to 3 percent.
EnB------------	Slight 1/-----------	Slight--------------	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent.
EnC------------	Moderate: Slopes of 8 to 15 percent.1/	Moderate: Slopes of 8 to 15 percent.	Moderate: Slopes of 8 to 15 percent.	Severe: Slopes of 8 to 15 percent.
Essex: EsA, EsB, EsC, EtB, EtC.	Severe: Slowly permeable fragipan within 2½ feet of surface.	Moderate: Fragipan within 2½ feet of surface; some very stony slopes of 8 to 15 percent.	Moderate: Fragipan within 2½ feet of surface; some very stony slopes of 8 to 15 percent.	Severe: Fragipan within 2½ feet of surface; some very stony slopes of 8 to 15 percent.
EtD------------	Severe: Slowly permeable fragipan; slopes of 15 to 25 percent.	Moderate: Slopes of 15 to 25 percent; very stony surface; fragipan within 2½ feet of surface.	Severe: Slopes of 15 to 25 percent; slowly permeable fragipan.	Severe: Slopes of 15 to 25 percent; slowly permeable fragipan.
EuB, EuC-------	Severe: Slowly permeable fragipan.	Severe: Extremely stony surface; fragipan within 2½ feet of surface.	Moderate: Extremely stony surface; severe on slopes of 15 to 25 percent.	Severe: Extremely stony surface; slowly permeable fragipan.
Fresh water marsh: Fr.	Very severe---------	Very severe---------	Very severe---------	Very severe.
Gloucester:				
GaA------------	Severe: Slowly permeable layer at depth of 2½ to 5 feet.	Moderate: A few surface stones and boulders; slowly permeable layer within 5 feet of surface.	Slight: A few surface stones and boulders.	Slight: A few surface stones and boulders.

See footnote at end of table.

TABLE 2.--ESTIMATED DEGREES OF LIMITATION FOR SELECTED USES IN COMMUNITY DEVELOPMENT--CONTINUED

Soil series and map symbols	Septic-tank fields	Homesites	School sites	Athletic fields or intensive play areas
Gloucester--Cont.				
GaB	Severe: Slowly permeable layer at depth of 2½ to 5 feet.	Moderate: A few surface stones and boulders; slowly permeable layer within 5 feet of surface.	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent.
GaC	Severe: Slowly permeable layer at depth of 2½ to 5 feet.	Moderate: Slopes of 8 to 15 percent; slowly permeable layer within 5 feet of surface.	Moderate: Slopes of 8 to 15 percent.	Severe: Slopes of 8 to 15 percent.
GbA	Slight 1/	Slight: A few surface stones and boulders.	Slight: A few surface stones and boulders.	Slight: A few surface stones and boulders.
GbB	Slight 1/	Slight: A few surface stones and boulders.	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent.
GbC, GdC	Moderate: Slopes of 8 to 15 percent; very stony surface in most places. 1/	Moderate: Slopes of 8 to 15 percent; very stony surface in most places.	Moderate: Slopes of 8 to 15 percent; very stony surface in most places.	Severe: Slopes of 8 to 15 percent; very stony surface in most places.
GdB	Moderate: Very stony surface. 1/	Moderate: Very stony and bouldery surface.	Moderate: Slopes of 3 to 8 percent; very stony and bouldery surface.	Moderate: Slopes of 3 to 8 percent; very stony and bouldery surface.
GcB	Severe: Slowly permeable layer at depth of 2½ to 5 feet.	Moderate: Very stony and bouldery surface.	Moderate: Slopes of 3 to 8 percent; very stony and bouldery surface.	Moderate: Slopes of 3 to 8 percent; very stony and bouldery surface.
GcC	Severe: Slowly permeable layer at depth of 2½ to 5 feet.	Moderate: Very stony and bouldery surface; slopes of 8 to 15 percent.	Moderate: Slopes of 8 to 15 percent; very stony and bouldery surface.	Severe: Slopes of 8 to 15 percent.
GcD	Severe: Slowly permeable layer at depth of 2½ to 5 feet; slopes of 15 to 25 percent.	Moderate: Slopes of 15 to 25 percent; very stony and bouldery surface.	Severe: Slopes of 15 to 25 percent.	Severe: Slopes of 15 to 25 percent.
GeB	Moderate: Extremely stony and bouldery surface. 1/	Severe: Extremely stony and bouldery surface.	Moderate: Slopes of 3 to 15 percent; extremely stony and bouldery surface.	Severe: Slopes of 3 to 15 percent; extremely stony and bouldery surface.

See footnote at end of table.

TABLE 2.--ESTIMATED DEGREES OF LIMITATION FOR SELECTED USES IN COMMUNITY DEVELOPMENT--CONTINUED

Soil series and map symbols	Septic-tank fields	Homesites	School sites	Athletic fields or intensive play areas
Gloucester--Cont.				
GeD------------	Severe: Slopes of 15 to 35 percent. 1/	Severe: Extremely stony and bouldery surface.	Severe: Slopes of 15 to 35 percent.	Severe: Slopes of 15 to 35 percent; extremely stony and bouldery surface.
Hinckley:				
HaA------------	Slight 1/-----------	Slight-------------	Slight-------------	Moderate: Gravelly surface soil.
HaB------------	Slight 1/-----------	Slight-------------	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent; gravelly surface soil.
HaC------------	Moderate: Slopes of 8 to 15 percent. 1/	Moderate: Slopes of 8 to 15 percent.	Moderate: Slopes of 8 to 15 percent.	Severe: Slopes of 8 to 15 percent.
HaE------------	Severe: Slopes of 15 to 35 percent. 1/	Moderate on slopes of 15 to 25 percent; severe on slopes of 25 to 35 percent.	Severe: Slopes of 15 to 35 percent.	Severe: Slopes of 15 to 35 percent.
Hollis-Charlton: HoB, HpC, HrC, HrD.	Severe: Bedrock within 2 feet of surface, or firm layer at depth of 3 to 5 feet.	Severe: Bedrock generally within 2 feet of surface; many outcrops of bedrock in most areas.	Severe: Shallow to bedrock; many outcrops of bedrock in most areas.	Severe: Bedrock generally within 2 feet of surface; many outcrops of bedrock in most areas.
Made land: Ma.				
(Properties variable; requires onsite investigation.)				
Merrimac:				
MeA, MfA-------	Slight 1/-----------	Slight-------------	Slight-------------	Slight.
MeB, MfB-------	Slight 1/-----------	Slight-------------	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent.
MeC, MfC-------	Moderate: Slopes of 8 to 15 percent. 1/	Moderate: Slopes of 8 to 15 percent.	Moderate: Slopes of 8 to 15 percent.	Severe: Slopes of 8 to 15 percent.
MfE------------	Severe: Slopes of 15 to 35 percent. 1/	Moderate on slopes of 15 to 25 percent; severe on slopes greater than 25 percent.	Severe: Slopes of 15 to 35 percent.	Severe: Slopes of 15 to 35 percent.
Muck: Mu, Mv-----	Very severe---------	Very severe---------	Very severe---------	Very severe.

See footnote at end of table.

TABLE 2.--ESTIMATED DEGREES OF LIMITATION FOR SELECTED USES IN COMMUNITY DEVELOPMENT--CONTINUED

Soil series and map symbols	Septic-tank fields	Homesites	School sites	Athletic fields or intensive play areas
Ninigret: NnA, NnB.	Severe: Slowly permeable substratum; temporary high water table within 2 feet of surface during winter and early in spring.	Moderate: Temporary high water table within 2 feet of surface during winter and early in spring; slowly permeable substratum.	Moderate: Temporary high water table within 2 feet of surface during winter and early in spring; some slopes of 3 to 8 percent.	Severe: Slowly permeable substratum.
Norwell: NoA, NoB, NpA, NpB.	Severe: High water table at or near surface for 7 to 9 months of the year; slowly permeable fragipan within 2½ feet of surface.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.
Peat: Pe----------	Very severe----------	Very severe----------	Very severe----------	Very severe.
Pittstown: PtA, PuB.	Severe: Slowly permeable fragipan within 2½ feet of surface; temporary high water table within 2 feet of surface during winter and early in spring.	Moderate: Fragipan within 2½ feet of surface; excess seepage or temporary high water table within 2 feet of surface during winter and early in spring.	Moderate: Fragipan within 2½ feet of surface; excess seepage or temporary high water table within 2 feet of surface.	Severe: Slowly permeable fragipan within 2½ feet of surface; some slopes of 8 to 15 percent.
Quonset:				
QuA------------	Slight 1/-----------	Slight--------------	Slight--------------	Slight.
QuB------------	Slight 1/-----------	Slight--------------	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent.
QuC------------	Moderate: Slopes of 8 to 15 percent. 1/	Moderate: Slopes of 8 to 15 percent.	Moderate: Slopes of 8 to 15 percent.	Severe: Slopes of 8 to 15 percent.
QuE------------	Severe: Slopes of 15 to 35 percent. 1/	Moderate: Most slopes 15 to 25 percent; severe on slopes greater than 25 percent.	Severe: Slopes of 15 to 35 percent.	Severe: Slopes of 15 to 35 percent.
Raynham: RaA-----	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.

See footnote at end of table.

TABLE 2.--ESTIMATED DEGREES OF LIMITATION FOR SELECTED USES IN COMMUNITY DEVELOPMENT--CONTINUED

Soil series and map symbols	Septic-tank fields	Homesites	School sites	Athletic fields or intensive play areas
Saco: Sa----------	Severe: Subject to flooding; high water table at or near surface for most of the year.	Severe: Subject to flooding; high water table at or near surface for most of the year.	Severe: Subject to flooding; high water table at or near surface for most of the year.	Severe: Subject to flooding; high water table at or near surface for most of the year.
Sanded muck: Sb--	Very severe---------	Very severe---------	Very severe---------	Very severe.
Scarboro: ScA, SdA.	Severe: High water table at or near surface for most of the year.	Severe: High water table at or near surface for most of the year; ponding of surface runoff.	Severe: High water table at or near surface for most of the year; ponding of surface runoff.	Severe: High water table at or near surface for most of the year; ponding of surface runoff.
Scituate:				
SeA, SeB, SfA, SfB.	Severe: Slowly permeable fragipan within 2½ feet of surface; temporary high water table at depth of about 1½ feet in many places.	Moderate: Fragipan within 2½ feet of surface; excess seepage or temporary high water table at depth of about 1½ feet in many places.	Moderate: Fragipan within 2½ feet of surface; excess seepage or temporary high water table at depth of about 1½ feet in many places.	Severe: Slowly permeable fragipan within 2½ feet of surface.
SgA, SgB-------	Severe: Slowly permeable fragipan within 2½ feet of surface; temporary high water table at depth of about 1½ feet in many places.	Severe: Extremely stony surface.	Moderate: Slowly permeable fragipan within 2½ feet of surface; extremely stony surface.	Severe: Slowly permeable fragipan within 2½ feet of surface; extremely stony surface.
Tidal marsh: Td--	Very severe---------	Very severe---------	Very severe---------	Very severe.
Tisbury: TsA-----	Severe: Excess seepage or temporary high water table at depth of about 1½ to 2 feet.	Moderate: Excess seepage or temporary high water table at depth of about 1½ to 2 feet.	Moderate: Excess seepage or temporary high water table at depth of about 1½ to 2 feet; slopes of 3 to 8 percent in some places.	Moderate: Excess seepage or temporary high water table at depth of about 1½ to 2 feet; slopes of 3 to 8 percent in some places.
Walpole: WaA-----	Severe: Slowly permeable layer within 2½ feet of surface; high water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: High water table at or near surface for 7 to 9 months of the year.	Severe: Slowly permeable layer within 2½ feet of surface; high water table at or near surface for 7 to 9 months of the year.

TABLE 2.--ESTIMATED DEGREES OF LIMITATION FOR SELECTED USES IN COMMUNITY DEVELOPMENT--CONTINUED

Soil series and map symbols	Septic-tank fields	Homesites	School sites	Athletic fields or intensive play areas
Warwick:				
WbA	Slight 1/	Slight	Slight	Slight.
WbB	Slight 1/	Slight	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent.
WbC	Moderate: Slopes of 8 to 15 percent.1/	Moderate: Slopes of 8 to 15 percent.	Moderate: Slopes of 8 to 15 percent.	Severe: Slopes of 8 to 15 percent.
WcC	Severe: Many outcrops of bedrock.	Severe: Many outcrops of bedrock.	Severe: Many outcrops of bedrock.	Severe: Many outcrops of bedrock.
Windsor:				
WnA	Slight 1/	Slight: Droughtiness causes some landscaping problems.	Slight	Moderate: Droughtiness causes difficulty in establishing and maintaining sod.
WnB	Slight 1/	Slight: Droughtiness causes some landscaping problems.	Moderate: Slopes of 3 to 8 percent.	Moderate: Slopes of 3 to 8 percent; droughtiness causes difficulty in establishing and maintaining sod.
WnC	Moderate: Slopes of 8 to 15 percent.1/	Moderate: Slopes of 8 to 15 percent.	Moderate: Slopes of 8 to 15 percent.	Severe: Slopes of 8 to 15 percent.
WnE	Severe: Slopes of 15 to 35 percent. 1/	Severe on slopes of 25 to 35 percent; moderate on slopes of 15 to 25 percent.	Severe: Slopes of 15 to 35 percent.	Severe: Slopes of 15 to 35 percent.

1/ Very rapidly permeable substratum may allow pollution of nearby shallow wells.

characteristics, grain size, plasticity, and reaction. Depth to the water table, depth to bedrock, and topography are also important in planning engineering works.

This soil survey can be used by engineers and others to—

1. Make studies that will aid in selecting and developing sites for industrial, business, residential, and recreational purposes.
2. Make estimates of soil properties that are significant in the planning of agricultural drainage systems, farm ponds, irrigation systems, and terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations at selected locations.
4. Locate probable sources of gravel for use in construction.
5. Correlate performance of engineering structures with soils, and thus gain information that will be useful in planning the design and in maintaining the structures.
6. Determine the suitability of the soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps, reports, and aerial photographs for the purpose of making special engineering maps and reports.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized, however, that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depths of layers here

reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by soil scientists may not be familiar to engineers, and some terms may have a special meaning in soil science. Many of these terms are defined in the Glossary at the back of this survey.

To be able to make the best use of the soil maps and the soil survey, the engineer should know the properties of the soil material and the condition of the soil in place. Table 3, page 30; table 4, page 34; and table 5, page 42, summarize the soil properties significant in engineering.

Engineering test data

Table 3 gives the results of tests on 12 samples from 4 extensive soil series in Plymouth County. These tests were performed by the Massachusetts Department of Public Works in cooperation with the Materials Division, U.S. Bureau of Public Roads, according to standard procedures of the American Association of State Highway Officials (AASHO) (*1*).[2] At least one profile of each series is modal, that is, near the central concept of the series; the others are within the range established for the series. Although the information is specific for each profile, it is intended for use only in the interpretation of the engineering properties of the series as a whole.

The engineering classifications of soils in this table are based on mechanical analyses and on the liquid and plastic limits of the soils. Mechanical analyses were made by both sieve and hydrometer methods: The material coarser than 0.074 millimeter (No. 200 sieve) was analyzed by the sieve method; the material passing the No. 200 sieve was analyzed by the hydrometer method. The liquid limit and plastic index were determined in accordance with ASTM Des. D423 and D424.

The tests that determine liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The *plastic limit* is the moisture content at which the material passes from a semisolid to a plastic state. The *liquid limit* is the moisture content at which the material passes from a plastic to a liquid state. The *plasticity index* is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition. The plastic limit ranges from very high in clay soils to zero in sandy loam and sand.

The moisture-density compaction data for the tested soils are also given in table 3. If a soil material is compacted at successively higher moisture contents, assuming that the compactive effort remains constant, the density of the compacted material will increase until the optimum moisture content is reached. After that the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density. Moisture-density data are important in earthwork, for, as a rule, optimum stability is obtained if the soil is compacted to the maximum dry density when it is at the optimum moisture content.

[2] Italic numbers in parentheses refer to Literature Cited, page 115.

Most highway engineers classify soil materials according to the system approved by the American Association of State Highway Officials (AASHO). In this system, soil materials are classified in seven principal groups. The groups range from A–1, which is for gravelly soils of high bearing capacity, to A–7, which consists of clay soils having low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest. The group index number is shown in parentheses following the soil group symbol. The AASHO classifications of the soils sampled and tested are given in the next to last column in table 3.

Some engineers prefer to use the Unified system (*17*). In this system, soil material is divided into 15 classes: Eight classes are for coarse-grained materials, six for fine-grained materials, and one for highly organic material. The coarse-grained materials are gravels and sands and are identified as GW, GM, GP, GC, SW, SM, SC, and SP. The fine-grained materials are silts and clays and are identified as ML, MH, CL, CH, OL, and OH. Mechanical analysis, liquid limit, and plasticity index are used to classify these coarse-grained and fine-grained materials. All highly organic soils are classed Pt. The Unified classification designation of the soils sampled and tested is given in the last column of table 3.

Estimated soil properties

Table 4 gives, for all the soils of Plymouth County, estimates of properties that affect engineering. The estimates are based on field observations and experience and on interpretations of actual tests by the Soil Conservation Service and the Bureau of Public Roads. Each soil series is classified according to the AASHO and the Unified systems. Many series have more than one classification because of the allowable texture range within the series or because of differences in texture within the profile.

Depth to a seasonal high water table, as used in table 4, applies to the normal water table or to a perched water table over a fragipan or over impervious strata of silt. Depth to a seasonal high water table is inferred from the depth of the mottled layer, which indicates that the soil is saturated part of the time.

Permeability was estimated for the soil as it occurs in place. The estimates were based on soil structure and porosity and were compared with permeability tests on undisturbed cores of similar soil material. Permeability classes are as follows: Very slow to slow, less than 0.2 inch per hour; moderately slow, from 0.2 to 0.63 inch; moderate, from 0.63 inch to 2.0 inches; moderately rapid, from 2.0 to 6.3 inches; rapid to very rapid, more than 6.3 inches.

The available water capacity is the approximate amount of capillary water in the soil when wet to field capacity. When the soil is "air dry," this amount of water will wet the soil material described to a depth of 1 inch without deeper percolation.

Reaction is stated as a pH value range and is based on observations of soil types in place.

The shrink-swell potential is an indication of the volume change to be expected of the soil material with changes in moisture content. This potential is based on volume-change

TABLE 3.--ENGINEERING

[Tests performed by the Massachusetts Department of Public Works in cooperation
standard procedures of the American Association

Soil name and location	Parent material	Mass. report number	Depth	Horizon	Moisture-density data 1/		Liquid limit 2/	Plasticity index 2/
					Maximum dry density	Optimum moisture		
			In.		Lb. per cu. ft.	Pct.		
Bernardston silt loam:								
200 yards SE. of Route 128, off Route 3A. (Modal)	Glacial till.	63-25	0-10	Ap	103	16	44	11
		63-15	10-17	B21	117	12	26	8
		63-9	22-36	Cx	126	11	19	7
100 yards from Plymouth-Norfolk County line, on Turkey Hill Road. (Coarse skeleton)	Glacial till.	63-3	0-9	Ap	96	20	53	12
		63-4	9-16	B21	118	12	35	NP
		63-2	26-36	Cx	122	10	21	4
Carver coarse sand:								
South Boundary Line Road, in Miles Standish State Forest. (Modal)	Glaciofluvial deposits.	9	4-9	B22	124	11	NP	NP
		18	19-27	B24	132	8	NP	NP
		12	40-53	C	107	12	NP	NP
0.25 mile S. of Tihonet, 100 feet E. of Tihonet Road. (Modal)	Glaciofluvial deposits.	4	0-5	A1	100	14	NP	NP
		5	12-17	B22	110	11	NP	NP
		3	29-50	C	107	12	NP	NP
100 yards S. of Beaverdam Road, and 20 yards E. of Sandwich Road. (Coarse skeleton)	Glaciofluvial deposits.	8	0-3	A2	106	12	NP	NP
		7	8-28	B22	123	8	NP	NP
		10	28-36	C	114	12	NP	NP
0.5 mile E. of Oakdale, on Minot Avenue, by borrow pit. (Very fine sand substratum)	Quartzose sand.	6	0-3	A2	103	13	NP	NP
		1	8-28	B22	108	13	NP	NP
		2	47-60	IIC	102	15	NP	NP
Essex coarse sandy loam:								
100 yards S. of farm, on Route 106. (Modal)	Glacial till.	63-17	0-10	Ap	105	15	30	4
		63-29	10-26	B2	121	11	NP	NP
		63-33	26-36	Cx	127	8	NP	NP
200 yards E. of Church Street, on woods road in Holly Hill. (Firm fragipan)	Glacial till.	63-11	7-22	B22	122	12	22	6
		63-12	28-42	C1x	128	8	13	NP
		63-10	42-60	C2x	132	7	16	NP

See footnotes at end of table.

TEST DATA

with the Materials Division, U.S. Bureau of Public Roads, in accordance with
of State Highway Officials (AASHO) (1)]

Mechanical analysis 3/4/										Classification	
Percentage passing sieve--						Percentage smaller than--					
3-in.	3/4-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.	AASHO	Unified 5/
100	92	78	69	58	46	44	31	14	7	A-7-5(3)	SM
6/100	91	80	72	60	43	43	40	23	13	A-4(2)	SC
100	82	67	62	51	44	44	40	22	13	A-4(2)	SM-SC
7/100	83	68	61	48	34	26	18	7	4	A-2-7(0)	SM
7/100	89	65	53	36	22	18	11	4	2	A-1-b(0)	SM
7/100	87	69	61	43	31	30	29	17	10	A-2-4(0)	SM-SC
---	100	97	96	65	27	26	17	8	5	A-2-4(0)	SM
100	97	85	74	35	18	12	8	7	6	A-1-b(0)	SM
100	96	92	88	68	3	3	3	2	1	A-3(0)	SP
---	---	---	100	70	9	8	4	2	0	A-3(0)	SP-SM
---	100	99	98	70	10	9	6	4	4	A-3(0)	SP-SM
---	100	99	97	68	5	5	3	0	0	A-3(0)	SP-SM
---	---	100	98	65	15	10	6	2	0	A-2-4(0)	SM
100	90	75	69	60	15	13	9	6	5	A-2-4(0)	SM
100	99	95	91	65	5	4	2	2	2	A-3(0)	SP-SM
---	---	---	100	94	20	14	6	2	1	A-2-4(0)	SM
---	---	100	99	94	25	15	10	5	3	A-2-4(0)	SM
---	---	100	99	98	55	36	15	2	2	A-4(4)	ML
100	95	90	89	77	49	40	20	7	3	A-4(3)	SM
7/100	98	94	90	76	42	35	22	10	6	A-4(1)	SM
7/100	97	90	84	68	34	28	20	9	4	A-2-4(0)	SM
6/100	97	90	85	64	36	32	21	11	8	A-4(0)	SM-SC
100	94	88	82	58	30	28	22	9	4	A-2-4(0)	SM
100	86	78	74	52	26	25	21	10	6	A-2-4(0)	SM

309-663—69——3

TABLE 3.--ENGINEERING

Soil name and location	Parent material	Mass. report number	Depth	Horizon	Moisture-density data 1/ Maximum dry density	Optimum moisture	Liquid limit 2/	Plasticity index 2/
			In.		Lb. per cu. ft.	Pct.		
Essex very stony coarse sandy loam:								
0.05 mile N. of old railroad crossing. (Thin fragipan)	Glacial till.	63-5 63-24 63-6	3-17 17-26 26-48	B22 B23 Clx	113 112 129	12 12 8	NP NP NP	NP NP NP
Merrimac sandy loam:								
50 yards E. of East Bridgewater town line, on Plymouth Street. (Modal)	Glacio-fluvial deposits.	63-20 63-32 63-19	1-12 12-23 31-48	B21 B22 IIC	118 123 119	11 10 13	19 NP NP	NP NP NP
50 yards W. of Grove Street, off Clay Pit Road. (Coarse textured)	Glacio-fluvial deposits.	63-1 63-23 63-18	2-10 10-26 26-50	B21 B22 IIC	107 122 129	17 11 9	NP 20 NP	NP NP NP
300 yards NW. of Short Street, off Cherry Street. (Cobbly subsoil)	Glacio-fluvial deposits.	63-30 63-14 63-21	1-14 14-24 24-36	B21 B22 IIC	104 113 134	17 13 8	NP 25 NP	NP NP NP

1/ Based on AASHO Designation: T 99-57, Method A (1).

2/ NP=Nonplastic.

3/ Based on sample as received in laboratory. Laboratory test data not corrected for amount discarded in field sampling.

4/ Mechanical analysis according to AASHO Designation: T 88-57 (1). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from the calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

5/ SCS and BPR have agreed to consider that all soils having plasticity indexes within two points from

TEST DATA--CONTINUED

Mechanical analysis 3/ 4/										Classification	
Percentage passing sieve--						Percentage smaller than--					
3-in.	3/4-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.	AASHO	Unified 5/
---	100	98	97	85	32	23	10	4	2	A-2-4(0)	SM
---	100	99	98	88	25	15	4	1	0	A-2-4(0)	SM
7/100	94	82	75	58	29	24	16	5	2	A-2-4(0)	SM
---	100	99	97	79	42	36	23	11	9	A-4(1)	SM
100	97	93	86	67	32	27	18	10	6	A-2-4(0)	SM
8/100	86	75	70	32	3	3	3	2	1	A-1-b(0)	SP
100	91	83	82	61	29	19	11	4	1	A-2-4(0)	SM
6/100	96	89	82	57	39	32	21	10	9	A-4(1)	SM
9/100	80	55	46	19	8	7	5	3	2	A-1-a(0)	SP-SM
8/100	98	96	94	80	54	40	22	8	5	A-4(4)	ML
9/100	90	87	85	73	49	42	26	10	7	A-4(3)	SM
10/100	77	56	46	17	9	8	4	2	1	A-1-a(0)	SW-SM

A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are GM-GC, SM-SC, and SP-SM.

6/ An estimated 5 percent of the sample consisted of fragments larger than 3 inches. These were discarded in field sampling.

7/ An estimated 10 percent of the sample consisted of fragments larger than 3 inches. These were discarded in field sampling.

8/ An estimated 25 percent of the sample consisted of fragments larger than 3 inches. These were discarded in field sampling.

9/ An estimated 15 percent of the sample consisted of fragments larger than 3 inches. These were discarded in field sampling.

10/ An estimated 20 percent of the sample consisted of fragments larger than 3 inches. These were discarded in field sampling.

TABLE 4.--ESTIMATED

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Depth from surface	Classification	
				USDA texture	Unified
	Feet	Feet	Inches		
Agawam:					
AfA, AfB	3-5+	>10	0-16	Fine sandy loam	SM
			16-26	Sandy loam	SM
			26-42	Fine sand	SP or SM
AgA, AgB	3-5+	>10	0-13	Fine sandy loam and loamy fine sand.	SM
			13-24	Sandy loam	SM
			24-30	Sand	SP or SM
			30-50	Silt and very fine sand	ML or CL
Au Gres: AuA, AuB	0-1	>10	0-4	Loamy sand	SM or SP
			4-48	Sand	SP or SM
For properties of Wareham component, refer to Wareham series.					
Belgrade: BaA, BaB	$1\frac{1}{2}$-3	>10	0-25	Silt loam	ML or CL
			25-42	Silt loam	ML or CL
Bernardston: BbB, BbC, BcB, BcD.	3-5	3-30+	0-22	Silt loam	SM or SC
			22-36	Silt loam	SM or SC
Birdsall: BdA	0-1	>10	0-9	Silt loam	ML or CL
			9-40	Silt and very fine sand	ML or CL
Borrow land: Bo, Br.					
Too variable to classify. Requires onsite investigation.					
Brockton: BsA, BtA	0	3-10+	0-11	Loam	ML or SM
			11-17	Gravelly loamy sand	SM
			17-42	Loamy sand	SM
Carver: CaA, CaB, CaC, CaE, CbA, CbB, CbC, CcD.	>5	>100	0-50	Coarse sand	SP or SM
For properties of Gloucester component of CcD, refer to Gloucester series.					
Charlton	3-5	3-10+	0-20	Fine sandy loam	SM
			20-25	Sandy loam	SM
			25-36	Gravelly sandy loam	SP or SM
Deerfield: DeA, DeB	$1\frac{1}{2}$-2	>10	0-10	Sandy loam	SM
			10-28	Loamy sand	SM
			28-42	Sand	SM or SP

PROPERTIES OF SOILS

Classification--continued: AASHO	Percentage passing sieve--: No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction	Shrink-swell potential
				Inches per hour	Inches per inch	pH	
A-2 or A-4	95-100	90-95	30-45	2.0-6.3	0.13-0.18	4.5-5.5	Low.
A-2 or A-4	95-100	90-95	25-45	2.0-6.3+	0.10-0.15	4.5-5.5	Low.
A-2 or A-3	90-100	85-90	10-35	>6.3	0.04-0.09	4.5-5.5	Low.
A-2 or A-4	90-100	75-95	30-45	2.0-6.3	0.13-0.18	4.0-5.5	Low.
A-2 or A-4	90-100	75-95	20-40	2.0-6.3+	0.10-0.15	4.0-5.5	Low.
A-1, A-2, or A-3	85-100	70-95	10-35	>6.3	0.04-0.09	4.0-5.5	Low.
A-4	100	95-100	55-95	<0.63	0.15-0.23	4.0-5.5	Low to moderate.
A-2 or A-3	90-100	90-100	5-35	2.0-6.3+	0.04-0.09	4.0-5.0	Low.
A-1, A-2, or A-3	90-100	85-100	2-35	>6.3	<0.04-0.09	4.5-5.0	Low.
A-4	95-100	95-100	60-95	0.63-2.0	0.15-0.23	4.5-5.5	Low to moderate.
A-4	95-100	95-100	55-95	<0.63	0.15-0.23	4.5-5.5	Low to moderate.
A-2 or A-4	70-85	55-75	25-45	0.63-2.0	0.15-0.20	4.5-6.0	Low.
A-2 or A-4	70-85	55-75	25-45	<0.2	0.15-0.20	4.5-6.0	Low.
A-4	100	100	70-90	0.63-2.0	0.15-0.23	4.5-6.0	Low to moderate.
A-4	100	100	70-90	<0.63	0.15-0.23	4.5-5.5	Low to moderate.
A-2 or A-4	75-100	65-95	15-55	2.0-6.3	0.10-0.20	4.0-6.0	Low.
A-2	65-95	60-90	15-30	2.0-6.3+	0.04-0.09	4.0-6.0	Low.
A-1 or A-2	65-95	60-90	15-30	<0.63	0.04-0.09	4.0-6.0	Low.
A-2 or A-3	75-100	70-100	10-30	>6.3	0.04-0.09	3.8-4.5	Low.
A-2 or A-4	75-95	75-95	30-50	2.0-6.3	0.16-0.22	4.5-5.5	Low.
A-2 or A-4	65-85	60-80	30-45	0.63-2.0	0.45-0.18	4.5-5.5	Low.
A-1 or A-2	60-90	45-85	10-35	2.0-6.3	0.10-0.14	4.5-5.5	Low.
A-2	95-100	95-100	15-30	2.0-6.3+	0.10-0.15	4.5-6.5	Low.
A-2	95-100	95-100	15-30	>6.3	0.04-0.09	4.5-6.0	Low.
A-2 or A-3	95-100	95-100	5-25	>6.3	<0.04	4.5-5.5	Low.

TABLE 4.--ESTIMATED

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Depth from surface	Classification: USDA texture	Classification: Unified
	Feet	Feet	Inches		
Dune land and Coastal beach: Du-	0-5+	3-10+	0-30	Coarse sand-------------------	SP or SM
Enfield: EnA, EnB, EnC----------	3-5+	>30	0-30	Very fine sandy loam----------	ML
			30-44	Gravelly coarse sand----------	SP, SM, or GP
Essex: EsA, EsB, EsC, EtB, EtC, EtD, EuB, EuC.	3-5+	5-30+	0-11	Coarse sandy loam-------------	SM
			11-24	Gravelly loamy coarse sand----	SM
			24-36	Coarse sandy loam-------------	SM
Fresh water marsh: Fr------------	0	5-30+	0-50	Organic material--------------	Pt
Gloucester:					
GaA, GaB, GaC, GcB, GcC, GcD-	3-5+	5-30+	0-8	Fine sandy loam---------------	SM
			8-40	Loamy sand and gravelly sand--	SM
			40-48	Gravelly loamy sand-----------	SM
GbA, GbB, GbC, GdB, GdC, GeB, GeD.	3-5+	5-30+	0-14	Loamy sand and gravelly loamy sand.	SM
			14-24	Gravelly loamy sand-----------	SM or GM
			24-40	Gravelly loamy sand-----------	SM or GM
Hinckley: HaA, HaB, HaC, HaE----	3-5+	5-20+	0-19	Gravelly loamy sand-----------	SM
			19-24	Very gravelly coarse sand-----	SM or SP
			24-40	Sand, gravel, and cobblestones.	SP or GP
Hollis: HoB, HpC, HrC, HrD------	3-5+	1-1½	0-18	Fine sandy loam---------------	SM
			18	Bedrock-----------------------	---------
For properties of Charlton component, refer to Charlton series.					
Made land: Ma.					
Too variable to classify. Requires onsite investigation.					
Merrimac: MeA, MeB, MeC, MfA, MfB, MfC, MfE.	3-5+	>10	0-23	Sandy loam--------------------	SM
			23-31	Gravelly loamy sand-----------	SM or SP
			31-48	Sand and gravel---------------	SP, SM, or GP
Muck: Mu, Mv--------------------	0	3-20+	0-11	Muck--------------------------	Pt
Requires onsite investigation.					
Ninigret: NnA, NnB--------------	1½	>10	0-28	Sandy loam--------------------	SM
			28-40	Silt loam---------------------	ML or CL

PROPERTIES OF SOILS--CONTINUED

Classification--continued AASHO	Percentage passing sieve-- No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction	Shrink-swell potential
				Inches per hour	Inches per inch	pH	
A-2 or A-3	95-100	90-100	0-20	>6.3	<0.04	4.5-5.5	Low.
A-4	90-100	90-100	60-85	0.63-2.0	0.13-0.23	4.5-5.5	Low to moderate.
A-1 or A-2	35-90	35-90	10-25	>6.3	<0.04	4.5-5.5	Low.
A-2	80-95	70-90	20-30	2.0-6.3+	0.10-0.18	4.0-5.5	Low.
A-2	70-95	60-80	15-30	>6.3	<0.04-0.09	4.0-5.0	Low.
A-2	70-95	60-80	15-35	<0.2-0.63	<0.04-0.13	4.0-5.0	Low.
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A-2	75-95	65-90	20-30	2.0-6.3+	0.13-0.18	4.0-5.0	Low.
A-2	70-95	60-80	15-30	>6.3	0.04-0.09	4.0-5.0	Low.
A-2	70-95	60-80	15-30	<0.2-0.63	0.04-0.09	4.0-5.0	Low.
A-2	60-95	55-90	20-30	2.0-6.3+	0.04-0.13	4.0-5.0	Low.
A-1 or A-2	55-95	50-90	15-30	2.0-6.3+	0.04-0.09	4.0-5.0	Low.
A-1 or A-2	40-95	35-90	10-35	2.0-6.3+	0.04-0.09	4.0-5.0	Low.
A-1 or A-2	70-95	65-90	15-35	>6.3	0.04-0.13	4.0-5.5	Low.
A-1 or A-2	35-90	30-90	5-15	>6.3	<0.04	4.0-5.5	Low.
A-1	25-80	15-60	0-5	>6.3	<0.04	4.0-5.0	Low.
A-2 or A-4	70-90	65-90	15-45	2.0-6.3+	0.13-0.18	4.0-5.0	Low.
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A-2 or A-4	80-95	70-90	20-45	2.0-6.3+	0.09-0.13	4.0-5.5	Low.
A-2 or A-3	70-90	65-90	10-35	>6.3	0.04-0.09	4.0-5.5	Low.
A-1 or A-2	45-75	40-70	0-10	>6.3	<0.04	4.0-5.5	Low.
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A-2	90-100	75-95	15-30	2.0-6.3+	0.10-0.13	3.8-5.0	Low.
A-4	95-100	95-100	55-95	<0.63	0.15-0.23	4.0-5.5	Low to moderate.

TABLE 4.--ESTIMATED

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Depth from surface	Classification	
				USDA texture	Unified
	Feet	Feet	Inches		
Norwell: NoA, NoB, NpA, NpB-----	0-1	3-10+	0-8 8-20 20-48	Sandy loam------------------- Loamy coarse sand------------- Sandy loam or loamy sand------	SM SM SM
Peat: Pe------------------------	0	3-20+	0-30	Peat--------------------------	----------
Requires onsite investigation.					
Pittstown: PtA, PuB-------------	$1\frac{1}{2}$	3-30+	0-22 22-30	Silt loam--------------------- Silt loam---------------------	SM or SC SM, SC, or GM
Quonset: QuA, QuB, QuC, QuE-----	3-5+	3-20+	0-9 9-16 16-34	Sandy loam------------------- Gravelly loamy sand----------- Very gravelly sand------------	SM SM or SP SP or GP
Raynham: RaA--------------------	0-1	>10	0-8 8-26 26-45	Silt loam--------------------- Silt loam--------------------- Silt loam---------------------	ML or CL ML or CL ML or CL
Saco: Sa------------------------	0	>10	0-17 17-30	Very fine sandy loam---------- Silt loam---------------------	SM or ML SM or ML
Sanded muck: Sb-----------------	0	>20	0-12 12-36	Coarse sand------------------- Organic material--------------	SM or SP Pt
Scarboro:					
ScA-------------------------	0	>10	0-9 9-14 14-48	Sandy loam------------------- Loamy sand-------------------- Sand and gravel---------------	SM SM SP, SM, or GP
SdA-------------------------	0	>10	0-10 10-22 22-40	Fine sandy loam--------------- Loamy sand-------------------- Silt loam---------------------	SM SM ML or CL
Scituate: SeA, SeB, SfA, SfB, SgA, SgB.	$1\frac{1}{2}$-3	5-30+	0-20 20-36 36-46	Sandy loam------------------- Sandy loam------------------- Loamy coarse sand-------------	SM SM SM
Tidal marsh: Td.					
Too variable to classify. Requires onsite investigation.					

PROPERTIES OF SOILS--CONTINUED

Classification--continued AASHO	Percentage passing sieve-- No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction	Shrink-swell potential
				Inches per hour	Inches per inch	pH	
A-2 or A-4	60-90	55-85	25-45	2.0-6.3	0.04-0.20	4.0-5.5	Low.
A-2	55-90	50-80	15-30	>6.3	0.04-0.09	4.0-5.5	Low.
A-2 or A-4	55-90	60-80	15-45	<0.2-0.63	0.04-0.13	4.0-5.5	Low.
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A-2 or A-4	70-85	55-75	25-45	2.0-6.3	0.15-0.20	4.5-5.5	Low.
A-2 or A-4	70-85	55-75	25-45	<0.2	0.15-0.20	4.5-5.5	Low.
A-1 or A-2	80-95	70-90	15-35	>6.3	0.04-0.13	3.8-5.0	Low.
A-1 or A-2	60-90	50-90	10-25	>6.3	0.04-0.09	3.8-5.0	Low.
A-1	25-80	15-60	0-10	>6.3	<0.04	3.8-5.0	Low.
A-4	95-100	95-100	70-95	0.63-2.0	0.15-0.23	4.5-5.5	Low to moderate.
A-4	95-100	95-100	70-95	0.2-0.63	0.15-0.23	4.5-5.5	Low to moderate.
A-4	95-100	95-100	60-95	<0.2-0.63	0.15-0.23	4.5-5.5	Low to moderate.
A-2 or A-4	75-100	70-100	30-80	0.63-2.0	0.13-0.23	4.5-5.5	Low to moderate.
A-1, A-2, or A-4	60-100	50-100	15-85	0.63-6.3+	0.04-0.23	4.5-5.5	Low to moderate.
A-2 or A-3	95-100	90-100	2-10	>6.3	<0.04	4.0-5.0	Low.
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A-2	90-100	80-95	15-30	2.0-6.3+	0.10-0.15	4.5-5.5	Low.
A-2	90-100	80-95	15-30	>6.3	0.04-0.09	4.0-5.5	Low.
A-1, A-2, or A-3	60-100	50-95	5-30	>6.3	<0.04	4.0-5.5	Low.
A-2 or A-4	90-100	75-95	20-40	2.0-6.3+	0.13-0.18	4.0-5.5	Low.
A-2	90-100	70-90	15-30	>6.3	0.04-0.09	4.0-5.5	Low.
A-4	95-100	95-100	55-95	<0.63	0.15-0.23	4.0-5.5	Low to moderate.
A-2	75-95	70-90	20-30	2.0-6.3+	0.10-0.13	4.0-6.0	Low.
A-2	70-95	60-80	15-30	2.0-6.3+	0.04-0.13	4.0-6.0	Low.
A-2	70-95	60-80	15-35	<0.2-0.63	0.04-0.13	4.0-6.0	Low.

TABLE 4.--ESTIMATED

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Depth from surface	Classification	
				USDA texture	Unified
	Feet	Feet	Inches		
Tisbury: TsA---------------------	1½	>30	0-30	Very fine sandy loam----------	ML
			30-40	Coarse sand and gravel--------	SP, SM, or GP
Walpole: WaA---------------------	0-1	>10	0-20	Fine sandy loam and sandy loam.	SM
			20-32	Silt loam---------------------	ML or CL
Wareham--------------------------	0-1	>5	0-6	Loamy sand--------------------	SM
			6-18	Gravelly loamy sand-----------	SM or SP
			18-48	Gravelly sand-----------------	SP, SM, or GP
Warwick: WbA, WbB, WbC, WcC 1/---	3-5+	>10	0-25	Fine sandy loam---------------	SM
			25-34	Very gravelly sand or gravelly sandy loam.	SP, SM, or GP
Windsor: WnA, WnB, WnC, WnE------	3-5+	>20	0-12	Loamy sand--------------------	SM
			12-41	Sand--------------------------	SP or SM

1/ WcC underlain by bedrock at depth of 48 inches.

PROPERTIES OF SOILS--CONTINUED

Classification--continued	Percentage passing sieve--			Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
				Inches per hour	Inches per inch	pH	
A-4	90-100	90-100	60-85	0.63-2.0	0.13-0.23	4.5-5.5	Low.
A-1 or A-2	35-90	35-90	10-25	>6.3	<0.04	4.0-5.5	Low.
A-2	90-100	75-95	15-30	2.0-6.3+	0.10-0.18	4.0-5.5	Low.
A-4	95-100	95-100	55-95	<0.63	0.15-0.23	4.5-6.0	Low to moderate.
A-2 or A-4	90-100	85-100	25-45	2.0-6.3+	0.04-0.15	4.0-5.0	Low.
A-2 or A-3	90-100	80-100	10-35	>6.3	<0.04-0.09	4.0-5.0	Low.
A-1, A-2 or A-3	50-100	40-100	3-25	>6.3	<0.04	4.0-5.0	Low.
A-2 or A-4	75-95	65-90	20-45	2.0-6.3+	0.13-0.18	4.0-5.5	Low.
A-1	45-75	40-70	0-10	>6.3	<0.04	4.0-5.5	Low.
A-2	95-100	95-100	10-30	>6.3	0.04-0.09	4.0-5.5	Low.
A-2 or A-3	90-100	85-100	5-15	>6.3	<0.04	4.0-5.5	Low.

TABLE 5.--INTERPRETATION OF

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of--		
			Topsoil	Sand and gravel	Road fill
Agawam: AfA, AfB	Good	Moderate	Good	Fair for sand; poor for gravel.	Fair
AgA, AgB	Fair	Moderate	Good	Fair for sand; not suitable for gravel.	Fair in solum; poor in silty substratum.
Au Gres: AuA, AuB	Poor	High	Poor	Poor	Poor
For properties of Wareham component, refer to Wareham series.					
Belgrade: BaA, BaB	Poor	High	Fair	Not suitable	Poor
Bernardston: BbB, BbC, BcB, BcD.	Fair	Moderate	Good; poor on stony phases.	Not suitable	Fair

See footnotes at end of table.

ENGINEERING PROPERTIES OF SOILS

Soil features affecting--						
Highway location	Farm ponds: Reservoir area	Farm ponds: Embankments 1/	Agricultural drainage	Irrigation	Diversions 2/	Waterways 2/
Soil properties favorable, except that banks are erodible.	Rapid to very rapid seepage.	Very rapid to rapid permeability; fair to good strength and stability; may be susceptible to piping.	Not needed---	Moderate water-holding capacity; rapid intake rate.	Rapid permeability in sandy material at depth of about 2 feet.	Erodible, especially on steeper slopes; moderate water-holding capacity at depth of 18 to 24 inches.
Seepage over silty substratum.	Very slow seepage because of silty substratum.	Rapid to very rapid permeability and fair to good strength and stability down to silty substratum; moderately slow to slow permeability, fair strength, and poor stability in silty layer; silty material susceptible to piping.	Not needed---	Moderate to high water-holding capacity; rapid intake rate.	Moderately slow to slow permeability in silty substratum, generally at depth of 24 to 30 inches.	Vegetation difficult to establish in silty substratum.
High water table in fall, winter, and spring; susceptible to frost heaving.	Very slow seepage when water table is high, and very rapid seepage when water table is low.	Rapid to very rapid permeability; intermittently wet; good to fair strength and stability.	Rapid to very rapid permeability; high water table.	Not needed; high water table; low water-holding capacity; rapid intake rate.	Not needed; rapid to very rapid permeability.	Not needed; most areas nearly level; high water table; low water-holding capacity.
Seasonal high water table; slopes erodible; susceptible to frost heaving.	Slow seepage--	Slow permeability; fair strength; poor stability; susceptible to piping.	Slow permeability; seasonal high water table or seepage.	High water-holding capacity; slow intake rate.	Slow permeability; erodible.	Highly erodible.
Subject to seepage and slides above fragipan; stones and some boulders; some steep slopes.	Very slow seepage because of fragipan at depth of 20 to 26 inches.	Slow permeability in fragipan, at depth of 20 to 26 inches; good to fair strength; fair stability; stones and some boulders.	Moderately rapid permeability in solum; slow permeability in fragipan, at depth of 20 to 26 inches; drainage not needed, except for seep spots.	High water-holding capacity; moderate intake rate.	Stony soil material; slowly permeable fragipan at depth of 20 to 26 inches; some areas too steep.	Stony soil material; fragipan at depth of 20 to 26 inches; seepage; some areas steep; difficult to establish vegetation in fragipan.

TABLE 5.--INTERPRETATION OF

Soil series and map symbols	Suitability for winter grading	Suscepti-bility to frost action	Suitability as source of-- Topsoil	Sand and gravel	Road fill
Birdsall: BdA	Not suitable.	High	Poor	Not suitable	Not suitable
Borrow land: Bo, Br. Too variable to classify.					
Brockton: BsA, BtA	Not suitable.	High	Poor	Not suitable	Fair
Carver: CaA, CaB, CaC, CaE, CbA, CbB, CbC, CcD. For properties of Gloucester component of CcD, refer to Gloucester series.	Good	Low	Poor	Good for sand; poor for gravel.	Good
Charlton	Fair	Moderate	Fair; poor on stony phases.	Not suitable	Good
Deerfield: DeA, DeB	Fair	Moderate	Poor	Good for sand; poor for gravel.	Good

See footnotes at end of table.

ENGINEERING PROPERTIES OF SOILS--CONTINUED

Soil features affecting--						
Highway location	Farm ponds		Agricultural drainage	Irrigation	Diversions 2/	Waterways 2/
	Reservoir area	Embankments 1/				
High water table most of the year; susceptible to frost heaving.	Very slow seepage because of silty material and high water table.	Slow permeability; fair to poor strength; fair stability; surface unsuitable in places; wet most of the year; susceptible to piping.	Slow permeability; high water table; outlets difficult to obtain.	Irrigation not needed; wet most of the year; high water-holding capacity; slow intake rate.	Not needed; level or nearly level; high water table.	Not needed; high water table; level or nearly level.
High water table most of the year; stones and boulders; susceptible to frost heaving; fragipan in most places.	Very slow seepage because of fragipan and high water table.	Rapid permeability in solum; slow permeability at depth of about 20 inches; wet most of the year; stones and boulders; good to fair strength; fair to poor stability.	High water table; slow permeability in fragipan; outlets difficult to obtain.	Not needed; wet most of the year.	Not needed; high water table; level or nearly level.	Not needed; high water table; level or nearly level.
Difficult to establish vegetation on banks because of droughtiness; some steep slopes; CcD has some stones and boulders.	Very rapid seepage.	Very rapid permeability; good to fair strength and stability; difficult to establish vegetation; CcD has some stones and boulders.	Not needed---	Very low to low water-holding capacity; rapid intake rate.	Not needed; very rapid permeability; some areas too steep; CcD has some stones and boulders.	Not needed; very low to low water-holding capacity; difficult to establish vegetation; some areas too steep; CcD has some stones and boulders.
Seepage in deep cuts; stony soil material.	Moderate to rapid permeability; stony soil material.	Stable; moderate to rapid permeability, slow if compacted; stony soil material.	Not needed---	Moderate water-holding capacity.	Stony soil material.	Stony soil material.
Seasonal high water table during winter and in spring.	Very rapid seepage in summer and in fall.	Rapid to very rapid permeability; good to fair strength and stability.	Rapid to very rapid permeability; seasonal high water table; subsurface drainage satisfactory.	Low water-holding capacity; rapid intake rate.	Not needed; most areas nearly level; rapid to very rapid permeability.	Not needed; most areas nearly level; rapid to very rapid permeability.

TABLE 5.--INTERPRETATION OF

Soil series and map symbols	Suitability for winter grading	Suscepti-bility to frost action	Suitability as source of-- Topsoil	Sand and gravel	Road fill
Dune land and Coastal beach: Du. Too variable to classify.					
Enfield: EnA, EnB, EnC----	Poor--------	Moderate------	Good------	Poor in solum; good in substratum.	Poor in solum; good in substratum.
Essex: EsA, EsB, EsC, EtB, EtC, EtD, EuB, EuC.	Fair--------	Moderate------	Fair; poor on stony phases.	Poor--------------	Good-------------------
Fresh water marsh: Fr-----	Not suitable.	High----------	Not suitable.	Not suitable------	Not suitable------------
Gloucester: GaA, GaB, GaC, GcB, GcC, GcD.	Good--------	Low-----------	Fair; poor on stony phases.	Poor--------------	Good-------------------

See footnotes at end of table.

ENGINEERING PROPERTIES OF SOILS--CONTINUED

Soil features affecting--						
Highway location	Farm ponds: Reservoir area	Farm ponds: Embankments 1/	Agricultural drainage	Irrigation	Diversions 2/	Waterways 2/
Difficult to establish vegetation in gravelly substratum on cut banks because of droughtiness; erodible.	Very rapid seepage in substratum.	Moderately rapid permeability in upper part; very rapid permeability in substratum; good to fair strength and stability in substratum.	Not needed; very rapid permeability in substratum.	High water-holding capacity; moderate intake rate.	Not needed; most areas nearly level; very rapid permeability in gravelly substratum.	Not needed; most areas nearly level; very rapid permeability in gravelly substratum; highly erodible.
Subject to seepage and slides above fragipan; stones and boulders.	Slow to very slow seepage because of fragipan at depth of about 24 inches.	Rapid to very rapid permeability in solum; slow permeability in fragipan, at depth of about 24 inches; good to fair strength; fair stability; stones and boulders.	Not needed, except for seep spots.	Moderate water-holding capacity; rapid intake rate.	Stones and boulders; slowly permeable fragipan at depth of 24 inches.	Stones and boulders; fragipan at depth of about 24 inches; seepage; difficult to establish vegetation in fragipan.
Flooded most of the year; highly organic material.	Very slow seepage because of high water table.	Not suitable; highly organic material.	High water table; in depressions; outlets difficult to obtain.	Not irrigated--	Not needed; level or nearly level.	Not needed; level or nearly level.
Stones and boulders; some steep slopes; seepage in deep cuts.	Rapid seepage--	Rapid to very rapid permeability in solum; slow permeability in substratum; good to fair strength and stability; stones and boulders.	Not needed---	Moderate to low water-holding capacity; rapid intake rate.	Stones and boulders; slowly permeable substratum.	Stones and boulders.

TABLE 5.--INTERPRETATION OF

Soil series and map symbols	Suitability for winter grading	Suscepti-bility to frost action	Suitability as source of-- Topsoil	Sand and gravel	Road fill
Gloucester--continued: GbA, GbB, GbC, GdB, GdC, GeB, GeD.	Good-------	Low----------	Poor-----	Poor--------------	Good-------------------
Hinckley: HaA, HaB, HaC, HaE.	Good-------	Low----------	Poor-----	Good--------------	Good-------------------
Hollis: HoB, HpC, HrC, HrD.	Fair-------	Moderate-----	Fair to very poor.	Not suitable------	Fair; shallow in places.
For properties of Charlton component, refer to Charlton series.					
Made land: Ma.					
Too variable to classify.					
Merrimac: MeA, MeB, MeC, MfA, MfB, MfC, MfE.	Good-------	Low----------	Fair-----	Good--------------	Good-------------------
Muck: Mu, Mv--------------	Not suita-ble.	High---------	Poor-----	Not suitable------	Not suitable-----------

See footnotes at end of table.

ENGINEERING PROPERTIES OF SOILS--CONTINUED

Soil features affecting--						
Highway location	Farm ponds: Reservoir area	Farm ponds: Embankments 1/	Agricultural drainage	Irrigation	Diversions 2/	Waterways 2/
Stones and boulders; few steep slopes; vegetation difficult to establish.	Very rapid seepage.	Rapid permeability in solum and substratum; good to fair strength and stability; stones and boulders.	Not needed----	Low water-holding capacity; rapid intake rate.	Rapid permeability; stones and boulders; vegetation difficult to establish.	Stones and boulders; vegetation difficult to establish.
Some steep slopes; difficult to establish vegetation on banks because of droughtiness.	Very rapid seepage.	Very rapid permeability; good to fair strength and stability.	Not needed----	Low water-holding capacity; rapid intake rate.	Very rapid permeability; gravelly material at depth of 8 to 24 inches; some areas too steep.	Low water-holding capacity; difficult to establish vegetation.
Many areas shallow to bedrock; rock outcrops; stones and some boulders; some strong slopes.	Moderate to rapid seepage; bedrock within 24 inches of surface in some areas.	Stones and boulders; moderately rapid to rapid permeability; good to fair strength; fair stability; bedrock within 24 inches of surface in places.	Not needed----	Low water-holding capacity; rapid intake rate; bedrock within 24 inches of surface in some areas.	Bedrock within 24 inches of surface in some areas; rock outcrops, about 5 to more than 100 feet apart; stony soil material.	Bedrock within 24 inches of surface in some areas; rock outcrops, about 10 to more than 100 feet apart; stony soil material.
Difficult to establish vegetation in gravelly substratum on cut banks because of droughtiness.	Very rapid seepage.	Very rapid to rapid permeability; good to fair strength and stability.	Not needed----	Moderate water-holding capacity; rapid intake rate.	Rapid permeability in gravelly substratum, at depth of 18 to 36 inches; some areas too steep.	Rapid permeability in gravelly substratum, at depth of 18 to 36 inches; difficult to establish vegetation in gravelly material; some areas too steep.
High water table most of the year; susceptible to frost heaving; highly organic material.	Very slow seepage because of high water table most of the year.	Highly organic material; unstable; wet.	High water table; many areas in depressions; outlets difficult to obtain.	Not irrigated; wet most of the year.	Not needed; high water table; level or nearly level.	Not needed; high water table most of the year; level or nearly level.

TABLE 5.--INTERPRETATION OF

Soil series and map symbols	Suitability for winter grading	Suscepti-bility to frost action	Suitability as source of--		
			Topsoil	Sand and gravel	Road fill
Ninigret: NnA, NnB--------	Fair--------	Moderate------	Good------	Fair in solum for sand; not suitable in substratum.	Good in solum; poor in silty substratum.
Norwell: NoA, NoB, NpA, NpB.	Not suita-ble.	High----------	Poor------	Not suitable------	Fair--------------------
Peat: Pe------------------	Not suita-ble.	High----------	Not suita-ble; use for top dressing.	Not suitable------	Not suitable-----------
Pittstown: PtA, PuB-------	Fair--------	Moderate------	Fair------	Not suitable------	Fair--------------------

See footnotes at end of table.

ENGINEERING PROPERTIES OF SOILS--CONTINUED

Soil features affecting--						
Highway location	Farm ponds: Reservoir area	Farm ponds: Embankments 1/	Agricultural drainage	Irrigation	Diversions 2/	Waterways 2/
Seasonal high water table; slopes erodible; seepage and slides above silty substratum.	Rapid seepage in solum; very slow seepage in silty substratum.	Moderately rapid to very rapid permeability and good to fair strength and stability in solum; slow to moderately slow permeability, fair strength, and poor stability in silty substratum.	Moderately rapid to very rapid permeability in solum; slow to moderately slow permeability in silty substratum; seasonal high water table.	Moderate to high water-holding capacity; moderate to rapid intake rate.	Not needed; most areas nearly level; slow to moderately slow permeability in silty substratum, at depth of 24 to 33 inches.	Not needed; most areas nearly level; slow to moderately slow permeability in silty substratum, at depth of 24 to 33 inches.
High water table; stones and boulders; susceptible to frost heaving.	Very slow seepage because of fragipan at depth of 12 to 24 inches and high water table.	Rapid to very rapid permeability down to fragipan; slow to moderately slow permeability in fragipan, at depth of 12 to 24 inches; intermittently wet; good to fair strength; fair stability; stones and boulders.	Rapid to very rapid permeability down to fragipan; slow to moderately slow permeability in fragipan, at depth of 12 to 24 inches; high water table.	Not irrigated; low to moderate water-holding capacity; rapid intake rate; high water table.	Not needed; most areas nearly level; high water table; slow to moderately slow permeability in fragipan, at depth of 12 to 24 inches; stony soil material.	Not needed; most areas nearly level; high water table; stony soil material.
High water table; susceptible to frost heaving; highly organic material.	Very slow seepage because of high water table most of the year.	Unstable; wet most of the year; highly organic material.	High water table; most areas in depressions; outlets difficult to obtain.	Not irrigated; wet.	Not needed; high water table; level or nearly level.	Not needed; high water table most of the year; level or nearly level.
Stones and some boulders; subject to seepage and slides above the fragipan; seasonal high water table.	Very slow seepage because of fragipan at depth of 18 to 24 inches.	Slow permeability in fragipan, at depth of 18 to 24 inches; good to fair strength; fair to poor stability; stones.	Moderate to rapid permeability in solum; slow permeability in fragipan, at depth of 18 to 24 inches; seasonal high water table or seepage.	Not irrigated; high water-holding capacity; moderate intake rate.	Stony soil material; slow permeability in fragipan, at depth of 18 to 24 inches.	Stony soil material; seepage; fragipan at depth of 18 to 24 inches; difficult to establish vegetation in fragipan.

TABLE 5.--INTERPRETATION OF

Soil series and map symbols	Suitability for winter grading	Suscepti-bility to frost action	Suitability as source of-- Topsoil	Sand and gravel	Road fill
Quonset: QuA, QuB, QuC, QuE.	Good	Low	Poor	Good	Good
Raynham: RaA	Poor	High	Poor	Not suitable	Not suitable
Saco: Sa	Not suitable.	High	Poor	Not suitable	Not suitable
Sanded muck: Sb	Not suitable.	High	Not suitable.	Not suitable	Not suitable
Scarboro: ScA	Not suitable.	High	Poor	Poor	Poor

See footnotes at end of table.

ENGINEERING PROPERTIES OF SOILS--CONTINUED

Soil features affecting--						
Highway location	Farm ponds: Reservoir area	Farm ponds: Embankments 1/	Agricultural drainage	Irrigation	Diversions 2/	Waterways 2/
Some steep slopes; difficult to establish vegetation on banks because of droughtiness.	Very rapid seepage.	Very rapid permeability; good to fair strength and stability.	Not needed---	Low water-holding capacity; rapid intake rate.	Very rapid permeability; gravelly material at depth of 1 to 2 feet; some areas too steep.	Low water-holding capacity; difficult to establish vegetation.
High water table; susceptible to frost heaving.	Very slow seepage.	Slow permeability; intermittently wet; fair strength; good to poor stability; susceptible to piping.	Slow permeability; seasonal high water table; surface drainage needed.	Not irrigated; high water table; high water-holding capacity; slow intake rate.	Not needed; level or nearly level; high water table.	Not needed; level or nearly level; high water table.
High water table; frequently flooded; susceptible to frost heaving.	Very slow seepage because of high water table.	Moderately slow to very rapid permeability; wet; good to fair strength; good to poor stability; susceptible to piping; surface may not be suitable.	High water table; subject to flooding; most areas in depressions; outlets difficult to obtain.	Not irrigated; high water table; subject to flooding.	Not needed; high water table; level or nearly level.	Not needed; high water table; subject to flooding; level or nearly level.
High water table; susceptible to frost heaving; highly organic material.	Very slow seepage because of high water table.	Not suitable; wet; highly organic material.	High water table; many areas in depressions; outlets difficult to obtain.	Rapid intake rate in sandy surface soil, variable in underlying material.	Not needed; level or nearly level.	Not needed.
High water table; susceptible to frost heaving.	Very slow seepage because of high water table.	Very rapid permeability; wet; good to fair strength and stability.	Very rapid permeability; high water table; most areas in depressions; outlets difficult to obtain.	Not irrigated; wet.	Not needed; high water table; level or nearly level.	Not needed; high water table; level or nearly level.

TABLE 5.--INTERPRETATION OF

Soil series and map symbols	Suitability for winter grading	Suscepti- bility to frost action	Suitability as source of-- Topsoil	Sand and gravel	Road fill
Scarboro--continued: SdA	Not suitable.	High	Poor	Poor in solum; not suitable in substratum.	Poor
Scituate: SeA, SeB, SfA, SfB, SgA, SgB.	Poor	Moderate	Good; poor on stony phases.	Not suitable	Fair
Tidal marsh: Td	Not suitable.	High	Not suitable.	Not suitable	Not suitable
Tisbury: TsA	Poor	High	Good	Poor in solum; fair in substratum.	Good in substratum

See footnotes at end of table.

ENGINEERING PROPERTIES OF SOILS--CONTINUED

Soil features affecting--						
Highway location	Farm ponds: Reservoir area	Farm ponds: Embankments 1/	Agricultural drainage	Irrigation	Diversions 2/	Waterways 2/
High water table; susceptible to frost heaving; silty substratum.	Very slow seepage because of high water table.	Very rapid to moderately rapid permeability, good to fair strength, and fair stability down to silty layer; slow permeability, fair strength, and good to poor stability in silty layer; wet.	Very rapid to moderately rapid permeability down to silty layer; slow permeability in silty layer; most areas in depressions; outlets difficult to obtain.	Not irrigated; wet.	Not needed; high water table; level or nearly level.	Not needed; high water table; level or nearly level.
Subject to seepage and slides above fragipan; seasonal high water table; stones and boulders.	Slow to very slow seepage because of fragipan at depth of 20 to 28 inches.	Moderately rapid to rapid permeability in solum; slow to moderately slow permeability in fragipan, at depth of 20 to 28 inches; good to fair strength and stability; stones and boulders.	Moderately rapid to rapid permeability in solum; slow to moderately slow permeability in fragipan, at depth of 20 to 28 inches; seasonal high water table or seepage.	Moderate water-holding capacity; moderate to slow intake rate.	Stones and boulders; slow to moderately slow permeability in fragipan, at depth of 20 to 28 inches.	Stones and boulders; fragipan at depth of 20 to 28 inches; seepage; difficult to establish vegetation in fragipan.
Tidal flooding; excessive settlement; salinity.	Material too variable to classify.	Variable stability and shrinkage; difficult to compact; high water table.	Tidal overflow; salinity; outlets difficult to obtain.	Not applicable.	Not applicable.	Not applicable.
Seasonal high water table.	Very rapid seepage.	Very rapid permeability in substratum; good to fair strength and stability.	Rapid permeability; seasonal high water table.	Moderate water-holding capacity and intake rate.	Not needed; most areas nearly level; very rapid permeability in gravelly substratum.	Not needed; most areas nearly level; very rapid permeability in gravelly substratum.

TABLE 5.--INTERPRETATION OF

Soil series and map symbols	Suitability for winter grading	Suscepti-bility to frost action	Suitability as source of--		
			Topsoil	Sand and gravel	Road fill
Walpole: WaA	Not suitable.	High	Poor	Poor in solum; not suitable in substratum.	Poor
Wareham	Poor	High	Poor	Poor	Poor
Warwick: WbA, WbB, WbC	Good	Low	Fair	Good	Good
WcC	Fair	Low	Poor to very poor.	Poor; rock outcrops.	Poor; rock outcrops
Windsor: WnA, WnB, WnC, WnE.	Good	Low	Poor	Good for sand; not suitable for gravel.	Fair

1/ Information also applies to dikes and levees.

ENGINEERING PROPERTIES OF SOILS--CONTINUED

Soil features affecting--						
Highway location	Farm ponds: Reservoir area	Farm ponds: Embankments 1/	Agricultural drainage	Irrigation	Diversions 2/	Waterways 2/
High water table; susceptible to frost heaving.	Very slow seepage because of high water table and silty substratum.	Moderately rapid to very rapid permeability, good to fair strength, and fair stability in solum; moderately slow to slow permeability, fair strength, and good to poor stability in silty substratum.	Moderately rapid to very rapid permeability in solum; moderately slow to slow permeability in silty substratum; high water table; outlets generally difficult to obtain.	Irrigation not needed; high water table; moderate water-holding capacity; rapid intake rate.	Not needed; most areas level; high water table.	Not needed; most areas level; high water table.
High water table in fall, winter, and spring; susceptible to frost heaving.	Very slow seepage when water table is high; very rapid seepage when it is low.	Rapid and very rapid permeability; intermittently wet; good to fair strength and stability.	Rapid and very rapid permeability; high water table.	Not needed; high water table; low water-holding capacity; rapid intake rate.	Not needed; rapid and very rapid permeability.	Not needed; high water table; most areas level or nearly level; low water-holding capacity.
Difficult to establish vegetation in gravelly substratum.	Rapid seepage in solum; very rapid seepage in gravelly substratum.	Rapid to very rapid permeability; good to fair strength and stability.	Rapid to very rapid permeability in substratum; drainage not needed.	Moderate water-holding capacity; rapid intake rate.	Rapid to very rapid permeability in gravelly substratum, at depth of 16 to 32 inches.	Rapid to very rapid permeability in gravelly substratum, at depth of 16 to 32 inches; difficult to establish vegetation in gravelly material.
Rock outcrops from 50 to 100 feet apart; difficult to establish vegetation.	Very rapid seepage; bedrock close to surface in some areas.	Rapid permeability; some rock outcrops; good to fair strength and stability.	Not needed; rapid permeability in substratum; bedrock within 24 inches of surface in some areas.	Moderate to low water-holding capacity; rapid intake rate; not usually irrigated.	Rapid permeability in gravelly substratum; rock outcrops; spots of shallow soil.	Rapid permeability in substratum; rock outcrops; spots of shallow soil.
Slopes erodible; difficult to establish vegetation because of droughtiness.	Very rapid seepage.	Very rapid permeability; good to fair strength and stability.	Not needed; very rapid permeability.	Low water-holding capacity; rapid intake rate.	Very rapid permeability; some areas too steep.	Erodible; low water-holding capacity; difficult to establish vegetation; some areas too steep.

2/ Unless otherwise stated, statements about soil properties and ratings apply to uppermost 2 feet of soil.

tests or observance of other physical properties or characteristics of the soil. In general, clays have a much greater shrink-swell potential than sands.

Interpretations

The suitability of the soils for some engineering uses and features that affect the use of the soils in construction are given in table 5. These interpretations are based on actual test data, on estimates based on soil texture, and on field experience.

As shown in table 5, soils that are most suitable for winter grading are sands, loamy sands, and sandy loams. Loams and silt loams and all poorly drained and very poorly drained soils are unsuitable for winter grading because they contain large amounts of moisture during the winter.

The soils that are the least susceptible to frost heaving generally are those that are excessively drained or well drained. The hazard of frost heaving becomes more severe as drainage becomes poorer.

To be suitable for topsoil, a soil should have a stone-free, medium-textured surface layer that contains a moderate amount of organic matter. This kind of material has a high moisture-holding capacity and is easily prepared for seeding. Vegetation can be established readily and maintained easily. Generally, the uppermost 5 to 9 inches is stripped from the surface for use as topsoil.

The suitability ratings for sand and gravel are based on the estimated quantity and quality of the sand and gravel in the soils and on field observations. A rating of good does not imply that all areas of the soil specified will produce sand or gravel that is economically workable.

Bank-run sand and gravel, from soils listed as fair to good sources of sand and gravel, are suitable for road fill. If used for aggregate in concrete work, the material must be screened and washed.

The suitability of soil material for road fill depends largely on its physical properties and on its natural content of water. Soil material that has a high content of silt and clay is rated poor or fair for road fill, depending on the natural content of water, the time it takes the soil material to dry, and the difficulty of handling or compacting the material. Peats, mucks, and soils that are high in clay are not suitable for road fill. The suitability ratings shown are comparative and are estimated on the basis of test data and field experience.

Factors that affect the location of highways are flooding, a high water table, seepage, highly plastic soil material, organic material, boulders, rocks, unstable slopes, and frost heaving.

Soils that are most suitable for reservoir areas are underlain by relatively impervious silt and clay or by a fragipan. Embankments and dams for farm ponds should consist of material that has strength and stability and that can be compacted to make it impervious. Dugout ponds are installed principally to intercept the water table. Water in the pond will fluctuate along with the water table.

Drainage systems are established primarily to prevent the accumulation of excess water. This is done either by intercepting and controlling its flow or by lowering the water table. Soils underlain by loose and friable material generally can be drained by tile drainage systems or other subsurface drains. Soils that have a slowly permeable layer require closer spacing of tile line. The nearer this layer is to the surface, the closer the spacing required. In silty soils, spacing may have to be so close that tiling is economically impractical except for draining random seeps and springs. Open ditches are the most effective means of draining such soils. The spaces between the ditches should be shaped by grading, smoothing, or bedding.

Use of Soils for Woodland[3]

Approximately 68 percent of Plymouth County, or about 290,000 acres, is covered by forest. This is about 8 percent of the forested land in the State. The woodland acreage in the county is gradually decreasing, particularly in the northern half of the county, where urban and suburban development is proceeding most rapidly.

Information pertaining to woodland management is given in tables 6 and 7.

Forest types

There are six forest types in the county—oak, pitch pine, white pine and oak, maple (swamp), white pine, and pine and maple (*8*).

The oak type occupies about 30 percent of the woodland and is the most extensive forest type in the county. The stands are 80 percent or more oak. A large proportion is scrub oak, especially on the sandy Carver and Gloucester soils, in the southeastern part of the county. In other parts of the county there are mature stands of scarlet, black, and red oak.

The pitch pine type makes up about 21 percent of the woodland. There are many pure stands, but generally this type is associated with scrub oak. The stands occur principally on the sandy Carver and Gloucester soils. More than half of the trees are small in size.

The white pine and oak type makes up nearly 20 percent of the woodland. At least 70 percent of the stand is white pine and oak, either of which may be dominant. The rest consists of pitch pine, maple, and other hardwoods. This type occurs on the Bernardston, Essex, Hinckley, Scituate, and other well drained, moderately well drained, and somewhat excessively drained soils (fig. 8).

The maple (swamp) type makes up about 15 percent of the woodland. The stands are nearly pure and contain many mature trees. This type is common on Muck and on the Brockton, Norwell, Scarboro, and other low, wet soils.

The white pine type makes up about 8 percent of the woodland. The stands are 80 percent or more white pine. The stands are scattered, and most stands are small, but they contain many marketable trees. This type occurs mostly on well-drained and somewhat excessively drained soils, such as the Merrimac, Agawam, and Gloucester.

The pine and maple type makes up only about 6 percent of the woodland. At least 70 percent of the stand is pine and maple. Other hardwoods make up the rest. Most

[3] This subsection was prepared with the assistance of CHARLES CHERRY, district forester, Southeastern Massachusetts.

Figure 8.—**Mixed stand of white pine and oak on Hinckley gravelly loamy sand, 8 to 15 percent slopes.**

stands occur on Muck and on the Brockton, Norwell, Scarboro, and other low, wet soils.

The distribution of forest types reflects not only the nature of the soils and the site conditions but also the land-use history of the county.

The forests of Plymouth County have a long history of disturbance by man. Long before the first white settlement, the Indian inhabitants burned the woodlands with slow ground fires to improve their deer pasture and berry supply and to make foot travel easier.[4] The area has since been plagued by many destructive forest fires. Pitch pine and scrub oak are dominant on the coarse sands in the southeastern part of the county, partly because of their ability to regenerate after fire damage.

Following settlement, and well into the 19th century, woodlands were cut heavily both for cordwood and to provide charcoal for local ironworks. Much of the woodland thus cleared was used for hay or for pasture. After the Civil War, farmland was gradually allowed to revert to woodland.

Definite trends of succession occur on abandoned farmland. On the finer textured soils, the growth of old-field stands of white pine is commonly the first stage of succession. After this growth has been harvested, the vigorous growth of shade-tolerant hardwoods tends to restrict the regeneration of pine. This results in mixed stands of hardwoods and white pine, but the hardwoods, chiefly scarlet oak and black oak, are dominant.

On the sandier soils, white pine meets with less competition from hardwoods. Most old-field stands of white pine have been cut several times but are still chiefly white pine. However, the more tolerant oaks and other hardwoods gradually invade these stands and, if left undisturbed, would eventually become dominant in the stands.

The present lumber production in the county is about 15 million board feet per year. Most of the sawmills are permanent. Logging practices have influenced the composition of some forest stands. Some stands have a high

[4] STANFORD, A. L. A HISTORY OF THE FORESTS OF CAPE COD. Unpublished master's thesis. Copy on file Harvard University, Harvard Forest, Petersham, Mass.

TABLE 6.--ESTIMATED POTENTIAL PRODUCTIVITY AND RATINGS FOR THE MAJOR LIMITATIONS AND HAZARDS AFFECTING MANAGEMENT OF WOODLAND

Soil series and map symbols	Site index range			Degree of limitation for--		Hazard of--	
	Upland oak	White pine	Red pine	Equipment	Woodland roads	Windthrow	Seedling mortality
Agawam: AfA, AfB, AgA, AgB.	55 to 64	60 to 69	60 to 69	Slight	Slight	Slight	Slight.
Au Gres: AuA, AuB	55 to 64	60 to 69	70 or more	Severe	Severe	Severe	Severe.
For Wareham component, see Wareham series.							
Belgrade: BaA, BaB	65 or more	70 or more	70 or more	Slight	Moderate	Slight	Slight.
Bernardston: BbB, BbC, BcB	55 to 64	60 to 69	70 or more	Slight	Slight	Slight	Slight.
BcD	55 to 64	60 to 69	70 or more	Moderate	Slight	Slight	Slight.
Birdsall: BdA	Not suitable	50 to 59	Not suitable	Severe	Severe	Severe	Severe.
Borrow land: Bo, Br.							
Requires onsite decision.							
Brockton: BsA, BtA	Not suitable	50 to 59	Not suitable	Severe	Severe	Severe	Severe.
Carver: CaA, CaB, CaC, CbA, CbB, CbC.	44 or less	49 or less	49 or less	Slight	Slight	Slight	Severe.
CaE	44 or less	49 or less	49 or less	Moderate on slopes of 15 to 25 percent; severe on slopes of more than 25 percent.	Slight	Slight	Severe.
CcD	44 or less	49 or less	49 or less	Slight on slopes of 8 to 15 percent; moderate on slopes of 15 to 25 percent; severe on slopes of more than 25 percent.	Slight	Slight	Severe.
For Gloucester component of CcD, see GeB and GeD of Gloucester series.							
Charlton: See Hollis series.							

Deerfield: DeA, DeB	55 to 64	50 to 59	60 to 69	Slight	Moderate	Slight	Slight.
Dune land and Coastal beach: Du.							
Not suitable for tree production.							
Enfield: EnA, EnB, EnC.	45 to 54	60 to 69	70 or more	Slight	Slight	Slight	Slight.
Essex:							
EsA, EsB, EsC, EtB. EtC.	55 to 64	50 to 59	60 to 69	Slight	Slight	Slight	Slight.
EtD	55 to 64	50 to 59	60 to 69	Moderate	Slight	Slight	Slight.
EuB, EuC	55 to 64	50 to 59	60 to 69	Severe	Severe	Slight	Slight.
Fresh water marsh: Fr.							
Not suitable for tree production.							
Gloucester:							
GaA, GaB, GaC, GbA, GbB, GbC, GcB, GcC, GdB, GdC.	45 to 54	50 to 59	60 to 69	Slight	Slight	Slight	Slight.
GcD	45 to 54	50 to 59	60 to 69	Moderate	Slight	Slight	Slight.
GeB, GeD	45 to 54	50 to 59	60 to 69	Severe	Severe	Slight	Slight.
Hinckley:							
HaA, HaB, HaC	45 to 54	50 to 59	50 to 59	Slight	Slight	Slight	Moderate.
HaE	45 to 54	50 to 59	50 to 59	Moderate on slopes of 15 to 25 percent; severe on slopes of more than 25 percent.	Slight	Slight	Slight.
Hollis:							
HoB, HpC	45 to 54	50 to 59	50 to 59	Moderate	Moderate	Moderate	Moderate.
HrC, HrD	45 to 54	50 to 59	50 to 59	Severe	Severe	Severe	Severe.
Ratings for Charlton component, same as for Hollis.							

TABLE 6.--ESTIMATED POTENTIAL PRODUCTIVITY AND RATINGS FOR THE MAJOR LIMITATIONS AND HAZARDS AFFECTING MANAGEMENT OF WOODLAND--CONTINUED

Soil series and map symbols	Site index range			Degree of limitation for--		Hazard of--	
	Upland oak	White pine	Red pine	Equipment	Woodland roads	Windthrow	Seedling mortality
Made land: Ma.							
Requires onsite decision.							
Merrimac:							
MeA, MeB, MeC, MfA, MfB, MfC.	45 to 54	60 to 69	50 to 59	Slight	Slight	Slight	Slight.
MfE	45 to 54	60 to 69	----------------	Moderate on slopes of 15 to 25 percent; severe on slopes of more than 25 percent.	Slight	Slight	Slight.
Muck: Mu, Mv	Not suitable	50 to 59	Not suitable	Severe	Severe	Severe	Severe.
Ninigret: NnA, NnB	65 or more	60 to 69	60 to 69	Slight	Moderate	Slight	Slight.
Norwell: NoA, NoB, NpA, NpB.	55 to 64	60 to 69	70 or more	Severe	Severe	Severe	Severe.
Peat: Pe	Not suitable	50 to 59	Not suitable	Severe	Severe	Severe	Severe.
Pittstown: PtA, PuB	65 or more	70 or more	70 or more	Slight	Moderate	Slight	Slight.
Quonset:							
QuA, QuB, QuC	45 to 54	50 to 59	50 to 59	Slight	Slight	Slight	Moderate.
QuE	45 to 54	50 to 59	50 to 59	Moderate on slopes of 15 to 25 percent; severe on slopes of more than 25 percent.	Slight	Slight	Moderate.
Raynham: RaA	55 to 64	60 to 69	70 or more	Severe	Severe	Severe	Severe.
Saco: Sa	Not suitable	50 to 59	Not suitable	Severe	Severe	Severe	Severe.
Sanded muck: Sb	Not determined	Not determined	Not determined	Severe	Severe	Severe	Severe.
Scarboro: ScA, SdA	Not suitable	50 to 59	Not suitable	Severe	Severe	Severe	Severe.

Scituate:							
SeA, SeB, SfA, SfB.	55 to 64	60 to 69	60 to 69	Slight	Moderate	Slight	Slight.
SgA, SgB	55 to 64	60 to 69	60 to 69	Severe	Severe	Slight	Slight.
Tidal marsh: Td.							
Not suitable for tree production.							
Tisbury: TsA	55 to 64	60 to 69	70 or more	Slight	Moderate	Slight	Slight.
Walpole: WaA	55 to 64	60 to 69	70 or more	Severe	Severe	Severe	Severe.
Wareham	55 to 64	60 to 69	70 or more	Severe	Severe	Severe	Severe.
Warwick:							
WbA, WbB, WbC	45 to 54	60 to 69	50 to 59	Slight	Slight	Slight	Slight.
WcC	44 or less	50 to 59	50 to 59	Moderate	Moderate	Moderate	Moderate.
Windsor:							
WnA, WnB, WnC	45 to 54	50 to 59	60 to 69	Slight	Slight	Slight	Moderate.
WnE	45 to 54	50 to 59	60 to 69	Moderate on slopes of 15 to 25 percent; severe on slopes of more than 25 percent.	Slight	Slight	Moderate.

percentage of hardwood trees because sources of seed for white pine have been removed by selective cutting. Other stands have been logged for hardwoods and now have a larger than normal percentage of white pine. Generally, though, the tendency is to cut selectively in such a way that there is no significant change in the composition of the stands.

Soil-woodland interpretations

Table 6 shows the estimated potential productivity of the soils in the county for specified trees or forest types and ratings for the major limitations and hazards affecting woodland management.

Site index, the most common method of measuring potential productivity, is the average height of the dominant and codominant trees in a fully stocked stand at the age of 50 years.

The estimates of potential productivity in table 6 are based on field measurements of site indexes in existing forest stands on different kinds of soil. Field measurements were made in 120 separate stands representing upland oak, white pine, and red pine growing on soils of 79 different soil series throughout Massachusetts. The descriptions and locations of study plots are on file in the State Office of the Soil Conservation Service, Amherst, Mass. Similar data from other New England States and New York were used to augment these field measurements.

The site index curves that were used to obtain the average site index ratings for each measured plot were from the following sources: Upland oak—site index curves for black oak group in Massachusetts, an unpublished study prepared in 1961 by the University of Massachusetts, Department of Forestry and Wildlife Management, based on 71 plots and measurements of 325 trees; white pine—site index curves for eastern white pine (*9*); red pine—site index curves for red pine, based on an unpublished study of 49 red pine plantation plots by the University of Massachusetts, Department of Forestry and Wildlife Management and nearly identical with those in Technical Notes 484, issued by the Lake States Forest Experiment Station (*14*).

Equipment limitations (trafficability) are rated according to the degree that soil characteristics restrict the use of equipment in harvesting trees. The limitation is slight if the slope is less than 15 percent and there is little or no restriction on the kind of equipment that can be used or on the time of the year that equipment can be used. The limitation is moderate if the slope is between 15 and 25 percent or the soils are shallow to bedrock and have some rock outcrops. The limitation is severe if the slope is more than 25 percent, the water table is at or near the surface for 7 months or more each year, or the soils are extremely stony or rocky.

Woodland road limitations are rated according to the degree that soil properties restrict or prohibit the construction of access roads. The limitation is slight if the soils are well drained to excessively drained and there are no problems in constructing woodland roads on the soils. The limitation is moderate if the soils are moderately well drained or are shallow to bedrock and have some rock outcrops. The limitation is severe if the soils are extremely stony or rocky or if the water table is at or near the surface for 7 months or more each year.

Windthrow hazard is affected by soil properties that control the development of root systems of trees. The rating is significant in planning the thinning, release cutting, and harvesting of stands and in determining a potential economic loss. The hazard is slight if trees are firmly and deeply rooted and are not blown over by normal wind. The hazard is moderate if trees develop adequate root systems for stability, but some are likely to be blown down if the soils are excessively wet and the wind is high. The hazard is moderate on some shallow soils. The hazard is severe if root development is not adequate to prevent trees from being blown over, and trees are likely to be blown down if the soils are wet and the wind is moderate or high. The rating is severe for soils that have a water table at or near the surface for 7 months or more each year, and for soils that are very shallow and have many rock outcrops.

Seedling mortality refers to the influence of soil properties on the survival of planted seedlings and the establishment of adequate stands when plant competition, disease, rodents, and other environmental factors are assumed to be under control. Also assumed are proper planting methods and the use of healthy stock of satisfactory grade. Seedling mortality is slight if there are no special problems, losses do not exceed 25 percent of the planted stock, and satisfactory restocking can be obtained by initial planting. The mortality is moderate if expected losses are ordinarily between 25 and 50 percent and some replanting is needed to fill in openings. Seedling mortality is generally moderate on soils that are droughty or are shallow to bedrock. Mortality is severe if losses of planted seedlings amount to more than 50 percent and considerable replanting, special seedbed preparation, and superior planting techniques are needed to obtain adequate restocking. The soils for which this hazard is rated as severe are poorly drained or very poorly drained, extremely rocky and shallow, or droughty.

Estimated growth and volume yield of major forest types

Table 7 gives growth and volume data for upland oak and white pine, which are the major forest types in the county, and for red pine, an introduced species. It is a guide for translating the site indexes in table 6 into potential yields of cordwood and board feet per acre. The site indexes given in the two tables are for unmanaged, fully stocked stands 50 years old. The yields of cordwood are from trees that are more than 4 to 5 inches in diameter at breast height (DBH) and are utilized to a 3- to 4-inch top. The board-foot yields for conifers are from trees that are 9 inches DBH, and those for hardwoods are from trees that are 11 inches DBH. Both are utilized to a 5- to 8-inch top.

The yield figures for upland oaks are for a composite of red, black, scarlet, white, and chestnut oaks and associated species. These data are in USDA Technical Bulletin 560. (*10*).

The yield data for white pine are adapted from USDA Bulletin 13 (*6*). Standard cord yields were obtained by converting cubic-foot volume at a rate of 90 cubic feet per cord. Board feet were obtained by applying individual tree yields from Connecticut Agricultural Experiment Station Bulletin 514 (*9*) to tree numbers and sizes in USDA Bulletin No. 13.

TABLE 7.--EXPECTED GROWTH AND ESTIMATED VOLUME PER ACRE IN UNMANAGED, FULLY STOCKED STANDS 50 YEARS OLD

Forest type or species	Site index	Cords		Board feet 1/	
		Annual growth	Total volume	Annual growth	Total volume
Upland oak.	70	0.70	35	200	10,000
	60	.50	25	125	6,250
	50	.40	20	65	3,250
	40	.20	10	30	1,500
White pine.	75	1.96	98	740	37,000
	65	1.56	78	560	28,000
	55	1.16	58	360	18,000
	45	.76	38	180	9,000
Red pine.	75	2.56	128	1,020	51,000
	65	1.98	99	760	38,000
	55	1.40	70	460	23,000
	45	1.08	54	340	17,000

1/ Yields for oak are by International 1/8-inch rule; yields for pine are by International 1/4-inch rule.

Yields for red pine are based on cubic-foot volumes obtained by measuring plots of various ages in plantations on a variety of soils. They are from an unpublished study made by Donald L. Mader, University of Massachusetts, Department of Forestry and Wildlife Management. Cordwood yields were calculated by a converting factor of 90 cubic feet per cord. Board feet were calculated by multiplying the cubic-foot volume by the ratio of board feet to cubic-foot volume developed for white pine.

Use of Soils for Wildlife[5]

The occurrence and abundance of wildlife are related to the soils. The relationships are indirect and are influenced by land use, kinds of plant cover, and topography. Waterfowl population, for example, is directly related to wetness. The abundance of deer, rabbits, and some other species may be related to soil fertility.

Information about the suitability of the soils for elements of wildlife habitat and for different classes of wildlife is given in table 8.

White-tailed deer are the only large game animals in Plymouth County. Small game includes ring-necked pheasants, quail, ruffed grouse, woodcocks, cottontail rabbits, varying hares, raccoons, and gray squirrels. The many ponds and cranberry-bog reservoirs provide habitat for native black ducks and wood ducks. The large number of migratory waterfowl that pass through the county use the marshes as a rest area. Beavers, which were extinct a few years ago, have been reintroduced and have caused flooding problems that make control of them necessary. Muskrats, otters, and mink are trapped to a limited extent.

[5] This subsection was prepared with the assistance of LEWIS C. SCHLOTTERBECK, district wildlife manager, Division of Fisheries and Game.

Ring-necked pheasants and quail are released annually in the county by the Massachusetts Division of Fisheries and Game. Both State and privately owned property is stocked. State-owned property is also managed for wildlife.

The principal game fish are brook trout, brown trout, rainbow trout, large-mouth bass, and pickerel. The Division of Fisheries and Game manages public waters for game fish. A few small ponds are privately owned and stocked.

A variety of salt-water fish can be caught along the shores of the county. On the Cape Cod Bay shore, the catch includes haddock, cod, mackerel, flounder, tuna, and striped bass. On the Buzzards Bay shore, the main catch is striped bass, bluefish, tautog, flounder, and scup.

Wildlife areas

The soil associations shown on the general soil map are grouped into four wildlife areas. These areas and the principal kinds of wildlife in each are discussed in the following paragraphs.

WILDLIFE AREA 1

This area is equivalent to soil association 1. It occurs mainly along the North River or adjacent to the shore. It consists mostly of Tidal marsh and of Dune land and Coastal beach. Waterfowl and muskrats are the principal kinds of wildlife in the area.

Tidal marsh provides some habitat for native waterfowl but is especially important to migratory birds. It differs widely in suitability for the various kinds of wildlife, chiefly because of differences in vegetation (*16*). There are three types of Tidal marsh in the county—coastal shallow fresh marsh, salt meadow, and salt marsh.

In coastal shallow fresh marsh, the soils are waterlogged and may be covered at high tide with as much as 6 inches of water. They occur near the tidal heads of streams, where the inflow of salt water is negligible but where tidal action causes streams to flood regularly. The vegetation consists principally of cattails, threesquare, grasses, sedges, and various shrubs. This type of marsh is commonly a transition zone between the uplands and salt marsh. It provides feeding and nesting places for ducks and wintering areas for geese. It also supplies suitable habitat for muskrats.

In salt meadow, the soils are always waterlogged but are seldom covered with tidewater. They are adjacent to areas of coastal shallow fresh marsh or salt marsh. The vegetation consists mainly of saltmeadow, cordgrass, and saltgrass. This type of marsh is used principally as a rest area by migrating and wintering ducks and geese. It is less important as a nesting and feeding area.

In salt marsh, the soils are covered regularly with tidewater. The vegetation consists mainly of saltmarsh cordgrass. This type of marsh is less extensive in the county than the other types. It is used principally by migrating ducks and geese.

Also in the area are tidal flats, which are the habitat of clams and other shellfish. Shallow water within the area contains many organisms that are important food for fish and shellfish.

WILDLIFE AREA 2

This area is equivalent to soil associations 7 and 8. It consists of irregular moraine hills and pitted plains. The

TABLE 8.--SUITABILITY OF SOILS FOR ELEMENTS OF WILDLIFE HABITAT AND KINDS OF WILDLIFE

[Key: 1 = well suited; 2 = suitable; 3 = poorly suited; 4 = unsuited. A range in suitability ("1, 2" for example) is given if the soil varies enough to include more than one of these categories]

Soil series and map symbols	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Deciduous woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Agawam:											
AfA, AgA----------	1	1	1	1	3	4	4	4	1	1	4
AfB, AgB----------	2	1	1	1	3	4	4	4	1	1	4
Au Gres and Wareham:											
AuA----------	3	2	2	2	2	2	1	1	2	2	1
AuB----------	3	2	2	2	2	3	4	4	2	2	4
Belgrade:											
BaA----------	2	1	1	1	3	3	3	3	1	1	3
BaB----------	2	1	1	1	3	4	4	4	1	1	4
Bernardston:											
BbB, BbC----------	2	1	1	1	3	4	4	4	1	1	4
BcB, BcD----------	4	3	1	1	3	4	4	4	3	2	4
Birdsall: BdA----------	4	4	3	3	1	1	1	1	4	3	1
Borrow land: Bo, Br. Not rated.											
Brockton:											
BsA----------	4	4	3	3	1	2	1	1	4	3	1
BtA----------	4	4	3	3	1	2	2	2	4	3	2
Carver:											
CaA, CaB, CaC, CaE, CbC----------	4	3	4	4	4	4	4	4	4	4	4
CbA, CbB----------	3	3	3	3	1	4	4	4	3	3	4
Carver and Gloucester:											
CcD 1/----------	4	3, 4	4	4	1, 2, 4	4	4	4	4	4	4
Deerfield:											
DeA----------	2	2	2	2	2	3	3	3	2	2	3
DeB----------	2	2	2	2	2	4	4	4	2	2	4

Dune land and Coastal beach: Du------------	4	4	4	4	4	4	4	4	4	4	4
Enfield:											
EnA------------------	1	1	1	1	3	4	4	4	1	1	4
EnB, EnC-------------	2	1	1	1	3	4	4	4	1	1	4
Essex:											
EsA, EsB, EsC--------	2	2	2	2	2	4	4	4	2	2	4
EtB, EtC, EtD--------	4	3	2	2	2	4	4	4	3	2	4
EuB, EuC-------------	4	4	2	2	2	4	4	4	3	2	4
Fresh water marsh: Fr-	4	4	4	4	4	1	1	4	4	4	1
Gloucester:											
GaA, GaB, GaC--------	2	2	2	2	2	4	4	4	2	2	4
GbA, GbB, GbC--------	2	2	2	2	2	4	4	4	2	2	4
GcB, GcC, GcD--------	4	3	2	2	2	4	4	4	3	2	4
GdB, GdC-------------	4	3	2	2	2	4	4	4	3	2	4
GeB, GeD-------------	4	4	2	2	2	4	4	4	3	2	4
Hinckley:											
HaA, HaB, HaC--------	3	3	3	3	1	4	4	4	3	3	4
HaE------------------	4	3, 4	3	3	1	4	4	4	4	3	4
Hollis-Charlton: 2/											
HoB------------------	2	2	2	2	2	4	4	4	2	2	4
HpC------------------	4	3	2	2	2	4	4	4	3	2	4
HrC, HrD-------------	4	4	3	3	1	4	4	4	4	3	4
Made land: Ma. Not rated.											
Merrimac:											
MeA------------------	2	2	2	2	2	4	4	4	2	2	4
MeB, MeC-------------	2	2	2	2	2	4	4	4	2	2	4
MfA, MfB, MfC--------	2	2	2	2	2	4	4	4	2	2	4
MfE------------------	3, 4	2	2	2	2	4	4	4	2, 3	2	4
Muck:											
Mu-------------------	4	4	4	4	4	2	1	1	4	3	1
Mv-------------------	4	4	4	4	4	3	1	1	4	4	2
Ninigret:											
NnA------------------	2	1	1	1	3	3	3	3	1	1	3
NnB------------------	2	1	1	1	3	4	4	4	1	1	4

See footnotes at end of table.

TABLE 8.--SUITABILITY OF SOILS FOR ELEMENTS OF WILDLIFE HABITAT AND KINDS OF WILDLIFE--CONTINUED

Soil series and map symbols	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Deciduous woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Norwell:											
NoA	3	2	2	2	2	2	1	1	2	2	1
NoB	3	2	2	2	2	3	4	4	2	2	4
NpA	4	4	2	2	2	2	2	2	3	2	2
NpB	4	4	2	2	2	3	4	4	3	2	4
Peat: Pe	4	4	4	4	4	2, 3	1	1	4	4	1, 2
Pittstown:											
PtA	2	1	1	1	3	3	3	3	1	1	3
PuB	4	3	1	1	3	4	4	4	3	2	4
Quonset:											
QuA, QuB, QuC	3	3	3	3	1	4	4	4	3	3	4
QuE	4	3, 4	3	3	1	4	4	4	4	3	4
Raynham: RaA	3	2	2	2	2	1	1	1	2	2	1
Saco: Sa	4	4	3	3	1	1	1	1	4	3	1
Sanded muck: Sb	4	4	4	4	4	3	1	1	4	4	2
Scarboro: ScA, SdA	4	4	3	3	1	2	1	1	4	3	1
Scituate:											
SeA	2	2	2	2	2	3	3	3	2	2	3
SeB	2	2	2	2	2	4	4	4	2	2	4
SfA	4	3	2	2	2	3	3	3	3	2	3
SfB	4	3	2	2	2	4	4	4	3	2	4
SgA	4	4	2	2	2	3	3	3	3	2	3
SgB	4	4	2	2	2	4	4	4	3	2	4
Tidal marsh: Td	4	4	4	4	4	1	3	4	4	4	2
Tisbury: TsA	2	1	1	1	3	3, 4	3, 4	4	1	1	3, 4
Walpole: WaA	3	2	2	2	2	1	1	1	2	2	1

Warwick:											
WbA------------------	1	1	1	1	3	4	4	4	1	1	4
WbB, WbC-------------	2	1	1	1	3	4	4	4	1	1	4
WcC------------------	4	3	2	2	2	4	4	4	3	2	4
Windsor:											
WnA, WnB, WnC--------	3	3	3	3	1	4	4	4	3	3	4
WnE------------------	4	3, 4	3	3	1	4	4	4	4	3	4

1/ Based on rating for Carver coarse sand.

2/ Based on rating for Hollis soils.

excessively drained and sandy Carver and Gloucester soils make up most of this area. Peat soils make up much of the rest. Most of the area is wooded with scrub oak and pitch pine, but there are also a few scattered stands of white pine. Many of the Peat soils have been developed for cranberry production.

The principal wildlife are deer, ruffed grouse, quail, pheasants, waterfowl, and varying hares. Several deep, clear lakes and several streams provide good trout fishing, and many of the smaller ponds contain pickerel and bass.

The dense growth of scrub trees and brush provides good cover for deer and a food supply of acorns, twigs, and buds. This kind of browse is partly the result of the many forest fires in the area. Winter snows are seldom deep enough to prevent extensive foraging. Deer seldom confine themselves to winter yards.

Good cover, food, and nesting sites for ruffed grouse are located in fringe areas around potholes containing Peat soils. Available food in these areas includes blueberries, blackberries, cranberries, bearberries, acorns, and the seeds of locust, pitch pine, catbrier, smooth sumac, and some herbaceous plants. A dense cover provides good nesting sites and makes the hunting of these birds difficult.

A poor supply of suitable food limits the wild population of quail and pheasants in this area. Suitable food crops are difficult to grow on these soils. Birds are released during the hunting season in established management areas.

Black ducks and wood ducks are the most prevalent native waterfowl. The many small ponds and cranberry-bog reservoirs provide good habitat for puddle ducks. The large lakes serve as resting places for migrating ducks and geese.

A limited number of varying hares are released annually in appropriate areas to supplement the native population. Varying hares find suitable habitat in laurel thickets and wet areas. Bark and twigs provide food, and the brushy areas provide cover.

WILDLIFE AREA 3

This area is equivalent to soil associations 4, 5, and 6. It consists of gently sloping plains, many swamps, and low hills and ridges. The soils are mostly sandy, but many are wet. About 20 percent of the area is used for cultivated crops and pasture, 70 percent is woodland, and the rest is residential. Most of the cultivated soils are in hay, although some silage corn is grown. The woodland consists mainly of mixed stands of white pine and hardwoods, but there are some stands of pitch pine, and most of the swamps contain red maple.

The principal wildlife in the area are deer, ruffed grouse, quail, pheasants, cottontail rabbits, varying hares, waterfowl, muskrats, and some beavers. The lakes, ponds, and streams provide fishing for black bass and pickerel.

Deer find good cover and food in the many swamps and in the brushy woodland. Acorns are plentiful and provide winter food. Hayfields and pastures provide grazing early in spring and late in fall.

Shrubs that produce seeds and berries that ruffed grouse prefer are plentiful in many parts of this area. Grouse also feed on the buds of trees such as birch, alder, and willow. The many thickets and brushy woodlands provide good cover and nesting sites.

Parts of this area have large populations of quail. Brushy borders between woods and fields provide food in the form of berries and seeds, as well as cover. Weeds along the edge of fields and in partly abandoned fields provide additional food, and black locust thickets are sources of a highly preferred food.

Pheasants use habitat similar to that used by quail, but they feed more in open fields on corn, millet, or other grain. Pheasants are released each year by the Division of Fisheries and Game, but the population is restricted by hunting pressure and predatory animals.

A wide variety of habitat is used by the large population of hares and cottontail rabbits in this area. The dense shrubby growth around swamps and in wet areas provides good food and cover. Brushy borders around fields also provide cover, and hayfields and pastures provide food.

Native black ducks and wood ducks use the habitat provided by ponds, streams, and swamps in the area. Good habitat is also provided by many of the cranberry-bog reservoirs. Damming small streams to form these reservoirs has flooded low wooded areas. Thus, the reservoirs now contain many dead trees that provide hiding and nesting sites for waterfowl.

Muskrats and beavers use the same habitat as waterfowl. Muskrats inhabit fresh-water marshes, open swamps, and reservoir areas. Both waterfowl and muskrats make use of beaver ponds.

WILDLIFE AREA 4

This area is equivalent to soil associations 2, 3, and 9. It consists of many moderately sloping hills interspersed with low, level, wet areas and gravelly plains. The dominant soils are well drained and moderately well drained, but there are also many poorly drained soils. Some soils are rocky. About 50 percent of the acreage is woodland. The rest is cropland, pasture, or residential areas. Most wooded sites are small and are surrounded by residential areas.

Cottontail rabbits and ruffed grouse are the principal wildlife. In some parts of the area, there are native pheasants and quail. Areas with suitable cover are not large enough to support many deer, and deer are menaced by wild dogs. Some streams provide fishing for brook trout, and ponds provide fishing for perch, pickerel, and black bass.

Cottontail rabbits find food and cover in the dense thickets of woody shrubs in wet areas. Hayfields provide good summer grazing, and brushy growth along the woodland borders furnishes good cover.

Ruffed grouse find food and cover in the brushy growth that borders woodlands. Many of these shrubs produce fruit or seeds used for food by grouse and other wildlife. The low wet areas that contain a dense thicket of shrubs also provide habitat for grouse.

Suitability of individual soils as wildlife habitat

In table 8 the soils of the county are rated according to their suitability for elements of wildlife habitat and their suitability for particular kinds of wildlife.

ELEMENTS OF WILDLIFE HABITAT

The elements for which the soils are rated in table 8 are defined in the following paragraphs.

Grain and seed crops are domestic grains or seed-producing herbaceous annuals planted for wildlife food. Examples of these plants are corn, wheat, millet, rye, and buckwheat.

Grasses and legumes are those planted for wildlife food and cover. Examples of these plants are fescue, brome, bluegrass, timothy, redtop, orchardgrass, reed canarygrass, clover, and alfalfa.

Wild herbaceous upland plants are native or introduced perennial grasses and forbs that provide food and cover principally for upland wildlife. These plants are established mainly through natural reseeding. Examples are wheatgrass, wildrye, oatgrass, strawberry, beggarweed, lespedeza, nightshade, goldenrod, and dandelion.

Deciduous woody plants are deciduous trees, shrubs, and woody vines that produce fruit, nuts, buds, catkins, twigs, and foliage that are eaten extensively by wildlife. These plants are commonly established by natural reseeding, but they may also be planted. Examples are oak, beech, cherry, hawthorn, dogwood, viburnum, maple, birch, poplar, blueberry, and rose.

Coniferous woody plants are cone-bearing trees and shrubs, used by wildlife primarily for cover but also for food in the form of browse, seeds, or fruitlike cones. These plants are commonly established by reseeding, but they may also be planted. Examples are pine, spruce, hemlock, redcedar, juniper, and yew.

Wetland food and cover plants are annual and perennial wild herbaceous plants that grow on damp or wet sites. These plants provide food and cover that are used mainly by wetland wildlife. Examples are smartweed, wild millet, bulrush, sedge, reed, wildrice, switchgrass, bluejoint, and cattail. Submerged or floating aquatics are not included.

Shallow water developments are impoundments, excavations, or constructions for the control of water. Generally the water is not more than 5 feet deep. Examples are shallow dugout ponds, impoundments formed by low dikes and levees, level ditches, and devices to control the water level of marshy streams.

Excavated ponds are dugout water areas. The water should be suitable in quality, depth, and supply for fish or wildlife. For example, a pond should have a minimum surface area of one-tenth of an acre, an average water depth of 6 feet over at least a fourth of the area, and a dependable high water table or other source of unpolluted water of low acidity.

No rating is given in table 8 for impounded ponds. The suitability of sites for such use generally is governed by the depth of soil over bedrock or coarse material, the suitability of the soil material for embankments, the suitability of underlying material for holding water, the source of water, the slope of the site, and the hazard of flooding.

KINDS OF WILDLIFE

The kinds of wildlife for which the soils are rated in table 8 are defined in the following paragraphs.

Openland wildlife are birds and mammals that normally frequent cropland, pastures, meadows, lawns, and areas overgrown with grass, herbs, and shrubs.

Woodland wildlife are birds and mammals that normally frequent wooded areas of hardwood trees and shrubs, coniferous trees and shrubs, or mixed stands of such plants.

Wetland wildlife are birds and mammals that normally frequent ponds, marshes, swamps, and other wet areas.

SUITABILITY RATINGS

The suitability ratings used in table 8 are defined in the following paragraphs.

309-663—69——6

Well suited (No. 1 in table 8) indicates that the soils have few limitations that restrict their use for the elements named or for the kind of wildlife specified. Good results are well assured.

Suitable (No. 2 in table 8) indicates that the soils are slightly or moderately limited in suitability for the elements named or for the kind of wildlife specified. More intensive management is needed, however, than on soils rated well suited, and good results are less well assured.

Poorly suited (No. 3 in table 8) indicates that the soils are rather severely limited in suitability for the elements named or for the kind of wildlife specified. Management of wildlife habitat may be difficult and expensive. Good results are not assured.

Unsuited (No. 4 in table 8) indicates that the soils are not suitable for the elements named or for the kind of wildlife specified or that the use of the soils for wildlife habitat is generally impractical. Results are doubtful.

Descriptions of Soils

This section describes the soil series and the mapping units in Plymouth County. The procedure is first to describe each soil series, and then to describe the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and the description of the soil series to which it belongs.

The soil series contains a brief description of a soil profile, the major layers from the surface downward. This profile is considered typical for all the soils of the series. If the profile for a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless the differences are apparent from the name of the mapping unit. Some technical terms are used in describing soil series and mapping units, simply because there are no nontechnical terms that convey precisely the same meaning. Many of the more commonly used terms are defined in the Glossary.

The acreage and proportionate extent of the mapping units are shown in table 9. Detailed technical descriptions of soil series are given in the section "Formation, Classification, and Morphology of Soils."

Agawam Series

The Agawam series consists of well-drained, nearly level or gently sloping soils that formed in thick deposits of water-sorted sandy material. These soils are nearly free of gravel to a depth of at least 3½ feet. They occupy plains and terraces along the Taunton River and its tributaries, chiefly in the west-central part of the county.

The plow layer consists of 6 to 10 inches of brown to dark-brown fine sandy loam. The upper part of the subsoil is strong-brown sandy loam; the lower part is yellowish brown. At a depth of about 2 feet is loose, light yellowish-brown fine sand that contains a few rounded pebbles.

In a few small areas, the surface layer is sandy loam, and in some places pebbles are scattered throughout both the surface layer and the subsoil.

Agawam soils are suited to most crops commonly grown in the county.

TABLE 9.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Soil	Acres	Percent
Agawam fine sandy loam, 0 to 3 percent slopes	700	0.2
Agawam fine sandy loam, 3 to 8 percent slopes	650	.2
Agawam fine sandy loam, silty subsoil variant, 0 to 3 percent slopes	310	.1
Agawam fine sandy loam, silty subsoil variant, 3 to 8 percent slopes	280	.1
Au Gres and Wareham loamy sands, 0 to 3 percent slopes	5,260	1.3
Au Gres and Wareham loamy sands, 3 to 8 percent slopes	350	.1
Belgrade silt loam, 0 to 3 percent slopes	1,350	.3
Belgrade silt loam, 3 to 8 percent slopes	960	.2
Bernardston silt loam, 3 to 8 percent slopes	170	(1/)
Bernardston silt loam, 8 to 15 percent slopes	800	.2
Bernardston very stony silt loam, 3 to 8 percent slopes	110	(1/)
Bernardston very stony silt loam, 8 to 25 percent slopes	220	.1
Birdsall silt loam, 0 to 3 percent slopes	1,700	.4
Borrow land, loamy material	480	.1
Borrow land, sandy and gravelly materials	560	.1
Brockton loam, 0 to 3 percent slopes	990	.2
Brockton extremely stony loam, 0 to 3 percent slopes	12,240	3.0
Carver coarse sand, 0 to 3 percent slopes	8,370	2.0
Carver coarse sand, 3 to 8 percent slopes	26,170	6.4
Carver coarse sand, 8 to 15 percent slopes	18,360	4.5
Carver coarse sand, 15 to 35 percent slopes	7,460	1.8
Carver loamy coarse sand, 0 to 3 percent slopes	840	.2
Carver loamy coarse sand, 3 to 8 percent slopes	620	.2
Carver loamy coarse sand, 8 to 15 percent slopes	610	.1
Carver and Gloucester soils, 8 to 35 percent slopes	34,390	8.4
Deerfield sandy loam, 0 to 3 percent slopes	6,010	1.5
Deerfield sandy loam, 3 to 8 percent slopes	1,740	.4
Dune land and Coastal beach	2,590	.6
Enfield very fine sandy loam, 0 to 3 percent slopes	150	(1/)
Enfield very fine sandy loam, 3 to 8 percent slopes	270	.1
Enfield very fine sandy loam, 8 to 15 percent slopes	90	(1/)
Essex coarse sandy loam, 0 to 3 percent slopes	1,470	.4
Essex coarse sandy loam, 3 to 8 percent slopes	4,840	1.2
Essex coarse sandy loam, 8 to 15 percent slopes	730	.2
Essex very stony coarse sandy loam, 3 to 8 percent slopes	12,640	3.1
Essex very stony coarse sandy loam, 8 to 15 percent slopes	2,210	.5
Essex very stony coarse sandy loam, 15 to 25 percent slopes	330	.1
Essex extremely stony coarse sandy loam, 3 to 8 percent slopes	1,930	.5
Essex extremely stony coarse sandy loam, 8 to 25 percent slopes	530	.1
Fresh water marsh	4,620	1.1
Gloucester fine sandy loam, firm substratum, 0 to 3 percent slopes	970	.2
Gloucester fine sandy loam, firm substratum, 3 to 8 percent slopes	640	.2
Gloucester fine sandy loam, firm substratum, 8 to 15 percent slopes	360	.1
Gloucester loamy sand, 0 to 3 percent slopes	380	.1
Gloucester loamy sand, 3 to 8 percent slopes	1,360	.3
Gloucester loamy sand, 8 to 15 percent slopes	150	(1/)
Gloucester very stony fine sandy loam, firm substratum, 3 to 8 percent slopes	7,540	1.8
Gloucester very stony fine sandy loam, firm substratum, 8 to 15 percent slopes	920	.2
Gloucester very stony fine sandy loam, firm substratum, 15 to 25 percent slopes	120	(1/)
Gloucester very stony loamy sand, 3 to 8 percent slopes	16,540	4.0
Gloucester very stony loamy sand, 8 to 15 percent slopes	3,620	.9
Gloucester extremely stony loamy sand, 3 to 15 percent slopes	2,520	.6
Gloucester extremely stony loamy sand, 15 to 35 percent slopes	430	.1
Hinckley gravelly loamy sand, 0 to 3 percent slopes	3,890	1.0
Hinckley gravelly loamy sand, 3 to 8 percent slopes	14,210	3.5
Hinckley gravelly loamy sand, 8 to 15 percent slopes	11,760	2.9
Hinckley gravelly loamy sand, 15 to 35 percent slopes	5,330	1.3
Hollis-Charlton fine sandy loams, 3 to 8 percent slopes	430	.1

See footnotes at end of table.

TABLE 9.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--CONTINUED

Soil	Acres	Percent
Hollis-Charlton very rocky fine sandy loams, 3 to 15 percent slopes	910	0.2
Hollis-Charlton extremely rocky fine sandy loams, 3 to 15 percent slopes	5,300	1.3
Hollis-Charlton extremely rocky fine sandy loams, 15 to 25 percent slopes	190	(1/)
Made land	1,610	.4
Merrimac fine sandy loam, 0 to 3 percent slopes	3,040	.7
Merrimac fine sandy loam, 3 to 8 percent slopes	1,630	.4
Merrimac fine sandy loam, 8 to 15 percent slopes	340	.1
Merrimac sandy loam, 0 to 3 percent slopes	1,880	.5
Merrimac sandy loam, 3 to 8 percent slopes	13,160	3.2
Merrimac sandy loam, 8 to 15 percent slopes	3,720	.9
Merrimac sandy loam, 15 to 35 percent slopes	1,110	.3
Muck, shallow	11,630	2.8
Muck, deep	8,210	2.0
Ninigret sandy loam, silty subsoil variant, 0 to 3 percent slopes	670	.2
Ninigret sandy loam, silty subsoil variant, 3 to 8 percent slopes	240	.1
Norwell sandy loam, 0 to 3 percent slopes	1,300	.3
Norwell sandy loam, 3 to 8 percent slopes	270	.1
Norwell extremely stony sandy loam, 0 to 3 percent slopes	830	.2
Norwell extremely stony sandy loam, 3 to 8 percent slopes	2,020	.5
Peat	22,370	5.5
Pittstown silt loam, 0 to 8 percent slopes	150	(1/)
Pittstown very stony silt loam, 3 to 15 percent slopes	130	(1/)
Quonset sandy loam, 0 to 3 percent slopes	50	(1/)
Quonset sandy loam, 3 to 8 percent slopes	750	.2
Quonset sandy loam, 8 to 15 percent slopes	570	.1
Quonset sandy loam, 15 to 35 percent slopes	340	.1
Raynham silt loam, 0 to 3 percent slopes	2,230	.5
Saco very fine sandy loam	2,110	.5
Sanded muck	12,420	3.0
Scarboro sandy loam, 0 to 3 percent slopes	14,150	3.5
Scarboro fine sandy loam, silty subsoil variant, 0 to 3 percent slopes	1,310	.3
Scituate sandy loam, 0 to 3 percent slopes	2,840	.7
Scituate sandy loam, 3 to 8 percent slopes	2,640	.6
Scituate very stony sandy loam, 0 to 3 percent slopes	4,290	1.1
Scituate very stony sandy loam, 3 to 8 percent slopes	8,030	2.0
Scituate extremely stony sandy loam, 0 to 3 percent slopes	1,790	.4
Scituate extremely stony sandy loam, 3 to 8 percent slopes	1,560	.4
Tidal marsh	21,970	5.4
Tisbury very fine sandy loam, 0 to 8 percent slopes	150	(1/)
Walpole fine sandy loam, silty subsoil variant, 0 to 3 percent slopes	1,350	.3
Warwick fine sandy loam, 0 to 3 percent slopes	660	.2
Warwick fine sandy loam, 3 to 8 percent slopes	270	.1
Warwick fine sandy loam, 8 to 15 percent slopes	90	(1/)
Warwick very rocky fine sandy loam, 3 to 15 percent slopes	400	.1
Windsor loamy sand, 0 to 3 percent slopes	3,160	.8
Windsor loamy sand, 3 to 8 percent slopes	6,300	1.5
Windsor loamy sand, 8 to 15 percent slopes	1,650	.4
Windsor loamy sand, 15 to 35 percent slopes	500	.1
Mines and pits	970	.2
Total area surveyed	2/408,530	

1/ Less than 0.05 percent. Items in this category total less than 0.5 percent of the area surveyed.

2/ Urban areas not surveyed (10,730 acres) and inland water make up difference between total area surveyed and total area of county (424,960 acres).

Water moves rapidly through the solum and through the underlying sand, but sufficient moisture is retained for normal plant growth during most seasons. The response to lime and fertilizer is good.

Agawam fine sandy loam, 0 to 3 percent slopes (AfA).—This soil has the profile described as typical of the series. Some areas of this soil are large. Included in mapping were small spots that are moderately well drained and a few areas of sandy loam.

This soil is easily worked. It dries out quickly in spring and after rainfall. It is well suited to most crops commonly grown in the county, especially market garden crops. In dry years, irrigation is needed.

Water erosion is not a hazard, but wind erosion is likely to cause some damage unless winter cover crops are grown. There are only slight limitations for most nonfarm uses. (Capability unit I–5)

Agawam fine sandy loam, 3 to 8 percent slopes (AfB).—This soil generally has short, irregular slopes. Included in the areas mapped are small areas of loamy sand.

This soil is easily worked, and it dries out quickly in spring and after rainfall. It is suited to most crops commonly grown in the county. In dry years, irrigation is needed.

Simple conservation measures are necessary to check wind and water erosion if crops are grown. There are slight to moderate limitations for most nonfarm uses. (Capability unit IIe–5)

Agawam Series, Silty Subsoil Variant

The Agawam series, silty subsoil variant, consists of nearly level or gently sloping, well-drained fine sandy loams. These soils formed in water-sorted material and are underlain at a depth of 2½ to 3½ feet by compact silt or very fine sand. They are free of gravel but in places contain some scattered pebbles. They occupy plains and terraces along the Taunton River and its tributaries, chiefly in the west-central part of the county.

The plow layer consists of 6 to 10 inches of brown to very dark brown fine sandy loam that is loose and crumbly. It is underlain by strong-brown fine sandy loam, reddish-yellow sandy loam, and pale-yellow sand to a depth of about 2½ to 3½ feet. At this depth, there is a light brownish-gray compact layer of silt or very fine sand. In places this layer is varved with thin layers of silt and very fine sand. It is slowly or moderately slowly permeable and is difficult to break with a spade.

These soils are suitable for most of the crops commonly grown in the county. The water-holding capacity is sufficient for good plant growth. The response to lime and fertilizer is good. The slowly or moderately slowly permeable silty layer severely limits the use of these soils for purposes that require onsite sewage disposal.

Agawam fine sandy loam, silty subsoil variant, 0 to 3 percent slopes (AgA).—This soil has the profile described for the silty subsoil variant of the Agawam series. It occurs in areas that were once glacial lakebeds. Included in the areas mapped are a few moderately well drained spots.

This soil is easy to work, and it is well suited to row crops. In dry years, supplemental irrigation is needed. The hazard of erosion is slight. (Capability unit I–5)

Agawam fine sandy loam, silty subsoil variant, 3 to 8 percent slopes (AgB).—Individual areas of this soil are small, and slopes are short and irregular. The underlying material is silt and very fine sand.

This soil is well suited to the crops commonly grown in the county, but simple conservation practices are needed to help control erosion and to maintain the organic-matter content. Water moves slowly downward through the underlying silty material. (Capability unit IIe–5)

Au Gres Series

The Au Gres series consists of nearly level to gently sloping, poorly drained loamy sands that formed in thick deposits of sand. These soils contain some pebbles. They occupy the low-lying parts of outwash plains.

In wooded areas, the surface layer consists of 4 inches of leaf litter mixed with loamy sand. In cultivated areas, the surface layer is dark grayish-brown loamy sand. It is underlain to a depth of 16 inches or more by a leached layer of grayish sand. Below this is dark reddish-brown sandy material that in places contains lighter colored mottles. This material is underlain by light brownish-gray sand in which there are many particles of coarse sand.

In some places the surface layer is sand, and in a few places it is sandy loam. A seasonal high water table is at or near the surface for 7 to 9 months each year. There are no layers that prevent water from moving rapidly downward. Thus, drainage can be improved readily if outlets are available.

Au Gres and Wareham loamy sands, 0 to 3 percent slopes (AuA).—These soils occupy many small low areas on outwash plains throughout the county. They are underlain by sand or gravelly sand. A water table is at or near the surface for 7 to 9 months each year. About 60 percent of an area is Au Gres soil, and about 40 percent is Wareham soil. The Au Gres soil has the profile described as typical for the series. The Wareham soil is described in detail under the heading "Wareham Series."

Where outlets are available, these soils can be drained sufficiently to be used for row crops. Undrained areas are suitable for moisture-tolerant grasses and legumes. Wetness severely limits the use of these soils for most nonfarm purposes. (Capability unit IVw–9)

Au Gres and Wareham loamy sands, 3 to 8 percent slopes (AuB).—These soils occupy many small low areas on outwash plains throughout the county. They are underlain by sand or gravelly sand. A water table is at or near the surface for 7 to 9 months each year. About 60 percent of the unit is Au Gres soil, and about 40 percent is Wareham soil. The Wareham soil is described in detail under the heading "Wareham Series."

Where outlets are available, these soils can be drained sufficiently to be used for row crops. Undrained areas are suitable for moisture-tolerant legumes and grasses for hay or pasture. Wetness severely limits the use of these soils for most nonfarm purposes. (Capability unit IVw–9)

Belgrade Series

The Belgrade series consists of moderately well drained soils that formed in glacial lakebed deposits of silt and very fine sand. These soils are along the Taunton River and its tributaries, in the west-central part of the county.

In cultivated areas, the plow layer is dark grayish-brown silt loam. It is granular and crumbly. The subsoil,

which extends to a depth of 2 feet or slightly more, tends to break into clods. The upper part is light yellowish-brown silt loam, and the lower part is light-gray silt loam mottled with yellowish-brown. The substratum is firm, dark-gray silt loam that is difficult to break with a spade.

Belgrade soils dry out slowly in spring and after heavy rain. Moisture moves slowly downward through the underlying layers. A large amount is retained for plants. There are few cracks or root channels in the lower part of these soils to aid water movement. Large amounts of fertilizer can be applied because the loss of nutrients through leaching is small.

These soils are well suited to silage corn and to grass.

Belgrade silt loam, 0 to 3 percent slopes (BaA).—This soil is underlain by silt or very fine sand. It has the profile described as typical for the Belgrade series. Individual areas are small and are irregular in shape. Small areas of very fine sandy loam are included in the areas mapped.

This soil warms up too late in spring to be suited to early row crops, but it is well suited to hay and pasture plants. It dries out slowly and is high in moisture-holding capacity. The loss of plant nutrients through leaching is small.

This soil occurs in low-lying areas where air drainage is poor. Thus, crops are more likely to be damaged by frost than on soils in nearby higher lying areas. In some places this soil receives surface runoff from higher areas.

Permeability is moderately slow or slow. Consequently, there are limitations for most nonfarm uses. (Capability unit IIw–4)

Belgrade silt loam, 3 to 8 percent slopes (BaB).—This soil is underlain by silt or very fine sand. Individual areas are small, and slopes are undulating and irregular. Included in the areas mapped are small areas of very fine sandy loam.

Except for the additional limitation caused by slope, this soil has the same limitations as Belgrade silt loam, 0 to 3 percent slopes, and it can be used in the same way. Unprotected areas erode rapidly.

Water is absorbed slowly and moves slowly downward through the soil material. Consequently, there are severe limitations for most nonfarm uses. Septic-tank filter fields cannot operate properly, and a concentration of runoff water, such as that from roofed or paved areas, is likely to cause erosion. (Capability unit IIw–4)

Bernardston Series

The Bernardston series consists of well-drained, gently sloping to moderately steep silt loams that formed in firm, dark-colored glacial till that contains many small, flat fragments of dark-gray phyllite. These soils are on smooth rounded hills, called drumlins, in the northeastern part of the county.

The plow layer is very friable, dark-brown silt loam and is 9 to 10 inches thick. The subsoil, which extends to a depth of about 2 feet, is very friable, yellowish-brown silt loam in the upper part and very friable, light olive-brown silt loam in the lower part. The underlying till is olive silt loam and contains small flat fragments of phyllite. It is very firm in place and is difficult to break with a spade. If removed, it breaks into platelike pieces.

The content of rock fragments ranges from 10 to 20 percent.

Bernardston soils are among the better farming soils in the county. They retain enough moisture for normal plant growth, and there is little loss of plant nutrients through leaching. Because air drainage is good on the drumlins, the frost-free season is slightly longer than that at lower elevations. Water is absorbed readily, but it moves slowly through the underlying fragipan. It tends to seep laterally downslope, above the fragipan, and to form seep spots at the foot of slopes.

Bernardston silt loam, 3 to 8 percent slopes (BbB).—This soil occupies drumlins in the northeastern part of the county. It has the profile described as typical for the series. Moderately well drained areas around seep spots are included in the areas mapped.

This soil is high in moisture-holding capacity. It is suitable for the crops commonly grown in the county. It is productive if management is good.

This soil is readily eroded by concentrations of runoff water from roofed or paved areas. The underlying fragipan prevents the proper functioning of septic-tank filter fields. (Capability unit IIe–2)

Bernardston silt loam, 8 to 15 percent slopes (BbC).—This soil occurs on drumlins in the northeastern part of the county. Included in the areas mapped are small areas of a moderately steep soil. In a few places the surface layer is lighter colored and the compact till is closer to the surface than in the profile described.

This soil is suitable for silage corn and improved hay or pasture. Alfalfa can be grown, but stands are short-lived.

The slow permeability of the underlying till limits the use of this soil for many nonfarm purposes. For example, septic-tank filter fields cannot operate effectively. A concentration of runoff water, such as that from roofed or paved areas, causes severe erosion. Unless proper drainage is provided, basements are likely to be flooded by seepage water if floors are placed below the level of the fragipan. (Capability unit IIIe–2)

Bernardston very stony silt loam, 3 to 8 percent slopes (BcB).—This soil occurs on drumlins in the northeastern part of the county. Stones are between 1 and 2 feet in diameter and are from 20 to 80 feet apart. Included in the areas mapped are a few small areas of nearly level soils, and a few small spots that are moderately well drained.

Stones limit the use of this soil for row crops. Most of the acreage is used for unimproved hay and pasture or for woodland. If enough stones are removed to make cultivation practical, this soil can be used and managed in the same way as Bernardston silt loam, 3 to 8 percent slopes.

There are severe limitations for most nonfarm uses because of the underlying fragipan. Unless proper drainage is provided, basements are likely to be flooded by seepage water if floors are laid below the level of the fragipan. Roads commonly are damaged by frost unless seepage is diverted. (Capability unit VIs–2)

Bernardston very stony silt loam, 8 to 25 percent slopes (BcD).—This soil occurs on drumlins in the northeastern part of the county. Included in the areas mapped are a few small areas in which the surface layer is lighter colored and the fragipan is closer to the surface than in the typical Bernardston soil.

Stones limit the use of this soil for row crops. Most of the acreage is used for unimproved hay and pasture or for woodland. Pasture grasses respond well to lime and fertilizer. If stones are removed and the soil is tilled, intensive conservation measures are needed to control erosion.

The fragipan, surface stoniness, and slope severely limit the use of this soil for most nonfarm purposes. Water moves so slowly through the fragipan that septic-tank filter fields cannot function properly. Effluent tends to seep laterally downslope, above the fragipan, and to form seep spots on the surface at the foot of slopes. Unless proper drainage is provided, basements are likely to be flooded by seepage water if floors are laid below the level of the fragipan. (Capability unit VIs–2)

Birdsall Series

The Birdsall series consists of nearly level, very poorly drained soils that formed in old lake deposits of silt and very fine sand. These soils are chiefly along the Taunton River and its tributaries, in the west-central part of the county. A few scattered areas are adjacent to the seashore. Most of the acreage is wooded with red maple and water-tolerant woody shrubs.

In wooded areas, the surface layer consists of 7 to 10 inches of very dark gray, granular silt loam that contains much organic matter and many fine roots. It is underlain by a thin layer of light brownish-gray silt loam. Below this are thin layers of gray silt and very fine sand. This material is difficult to dig and breaks into thin, platelike pieces if removed.

In places, the underlying material consists only of silt, which breaks into large clods. The water table is at or near the surface during much of the year. Permeability is moderately slow or slow.

Birdsall silt loam, 0 to 3 percent slopes (BdA).—This soil occupies low flats in the west-central part of the county and a few low spots near the seashore. Included in some of the areas mapped are small areas of very fine sandy loam. In some places there are no varves in the underlying material.

This soil is difficult to drain because few suitable outlets are available and the water table is at or near the surface much of the year. Water moves slowly downward through the soil and at times is ponded on the surface. A limited amount of pasture can be obtained late in summer. Trees grow fairly well, but there are few trees of commercial value.

Extreme wetness limits the use of this soil for most nonfarm purposes. Many sites are suitable for development as shallow ponds for waterfowl. (Capability unit VIw–4)

Borrow Land

This land type is most common in the northern half of the county, near new residential developments or other construction projects. All of the surface soil and some of the subsoil have been removed from these areas for use as topsoil.

Borrow land, loamy material (Bo).—All of the surface soil and some of the subsoil have beeen removed from these areas, and the remaining material is loose or compact glacial till, such as that underlying the Gloucester and Essex soils. This material generally is devoid of plant nutrients and is a poor rooting medium. Vegetation does not reestablish itself naturally. Most tracts are littered with stones and boulders. The characteristics of the individual areas vary considerably. Thus, no capability classification is made.

Borrow land, sandy and gravelly materials (Br).—All of the surface soil and some of the subsoil have been removed from these areas, and the remaining material is sand or sand and gravel, such as that underlying the Agawam and Merrimac soils. This material generally is devoid of plant nutrients, and it does not hold sufficient moisture for vegetation to reestablish itself naturally. The characteristics of the individual areas vary considerably. Thus, no capability classification is made.

Brockton Series

The Brockton series is made up of very poorly drained, level or nearly level soils that formed in coarse-textured, stony glacial till. These soils occur in low-lying areas and along small streams. They are widely scattered throughout all parts of the county except the southeastern part. Most areas are bordered by better drained, gently rolling soils that formed in glacial till. A small acreage is cleared and used for pasture, but most of the acreage is extremely stony and is wooded with red maple, elm, and moisture-tolerant shrubs.

In wooded areas, the surface layer consists of 10 to 14 inches of black, granular loam that contains many roots and some stone fragments. It is underlain to a depth of 18 to 24 inches by gray or light-gray, loose, gravelly loamy sand. Below this is grayish loamy sand that contains many small subangular fragments. In most places this material is firm and is difficult to break with a spade. Below a depth of about 17 inches, the loamy sand is mottled with yellowish brown.

The water table is at or near the surface during much of the year. Drainage is difficult because suitable outlets are lacking and water movement through the fragipan is moderately slow or slow. There are good sites for the development of shallow water impoundments.

Brockton loam, 0 to 3 percent slopes (BsA).—This soil has the profile described as typical for the series. It occurs as small scattered areas, chiefly in the northern and western parts of the county. The water table is at or near the surface much of the year. Most of the acreage is either idle or in pasture.

Extreme wetness limits the use of this soil, both for farming and for other purposes. A limited amount of pasture can be obtained late in summer. There are suitable sites for the development of shallow ponds for wetland wildlife. (Capability unit Vw–2)

Brockton extremely stony loam, 0 to 3 percent slopes (BtA).—This soil occurs as scattered, low-lying areas throughout most of the county. It has the profile described as typical for the series except that stones and boulders cover more than 2 percent of the surface. The water table is at or near the surface most of the year. Included in the areas mapped are small areas of a poorly drained soil and some areas that have a gradient of more than 3 percent. Nearly all the acreage is in woodland. Most of the trees are red maples. There are few of commercial value.

Extreme wetness limits the use of this soil, both for farming and for most nonfarm purposes. Drainage generally is difficult because of the fragipan and the lack of suitable outlets. There are many good sites for the development of shallow ponds. (Capability unit VIIs–24)

Carver Series

The Carver series consists of excessively drained, nearly level to steep sandy soils that formed in thick deposits of coarse, pebbly quartz sand. These are the coarsest textured soils in the county. They occupy much of the pitted and dissected outwash plain in the southeastern part. Most of the acreage is wooded with pitch pine and scrub oak.

In wooded areas, the leaf litter is underlain by a 4- to 6-inch layer of black coarse sand that contains a few pebbles. Below this is a 2- or 3-inch layer of gray coarse sand. The subsoil, which extends to a depth of 2 to 2½ feet, is coarse sand that is strong brown and yellowish brown in the upper part and fades to brownish yellow in the lower part. Roots are common in the upper part and few in the lower part. Generally, a few pebbles are scattered throughout the subsoil. The substratum is light yellowish-brown or pale-brown coarse sand that contains many coarse quartz grains and scattered pebbles.

In most places Carver soils are coarse sand, but in some places the surface layer and the upper part of the subsoil are loamy coarse sand. In many places the surface layer contains numerous small pieces of charcoal, and the gray layer is darker colored than is typical.

Water moves rapidly downward through the solum and the underlying substratum. These soils do not retain enough moisture for good plant growth, and they are extremely acid.

Carver coarse sand, 0 to 3 percent slopes (CaA).—This soil has the profile described as typical for the series. It occupies the higher lying parts of the outwash plain, in the southeastern part of the county. Individual areas are large. Small areas of loamy coarse sand are included in the areas mapped.

This soil does not retain sufficient moisture for good plant growth, and it is rapidly leached of plant nutrients.

The limitations for most nonfarm uses are slight because this soil is nearly level and is rapidly permeable. (Capability unit VIIs–9)

Carver coarse sand, 3 to 8 percent slopes (CaB).—This soil occurs on the pitted and dissected outwash plain in the southeastern part of the county. Most areas are large. Small areas of loamy coarse sand are included in the areas mapped.

This soil does not retain sufficient moisture for good plant growth, and it is rapidly leached of plant nutrients.

Vegetation is difficult to establish and maintain. Otherwise, the limitations for most nonfarm uses are slight or moderate. (Capability unit VIIs–9)

Carver coarse sand, 8 to 15 percent slopes (CaC).—This soil occurs in the southeastern part of the county, mainly around potholes and along stream and erosion channels that pit and dissect the outwash plain. In some places the surface is more pebbly than is typical.

This soil does not retain sufficient moisture for good plant growth. If fertilizer is applied, much is lost through leaching.

Limitations for most nonfarm uses are moderate to severe. The gradient limits the use of this soil for purposes that require large level sites. (Capability unit VIIs–9)

Carver coarse sand, 15 to 35 percent slopes (CaE).—This soil occurs along the sides of potholes and drainage channels on the outwash plain and also on moraines, in the southeastern part of the county. In some places the surface layer is thinner and the subsoil is lighter colored than that described in the typical profile.

Coarse texture, droughtiness, and slope severely limit the use of this soil for farming or other purposes. Vegetation is difficult to establish and maintain. Few trees of commercial value grow naturally. This soil is suitable for such recreational uses as hiking trails. (Capability unit VIIs–9)

Carver loamy coarse sand, 0 to 3 percent slopes (CbA).—This soil is underlain by deep deposits of coarse, pebbly sand. It has a profile similar to the one described as typical of the series except that the surface layer and upper part of the subsoil are loamy coarse sand and the gray layer, just below the thin black surface mat, is 1 inch or less in thickness. Small areas of very fine sandy loam are included in the areas mapped.

There are slight limitations for most nonfarm uses. Individual tracts are fairly large, and little grading is required to level them. Considerable care is required, however, to establish and maintain vegetation on lawns, airfields, or recreation areas, because this soil is droughty. (Capability unit IVs–9)

Carver loamy coarse sand, 3 to 8 percent slopes (CbB).—This soil is underlain by deep deposits of coarse sand. It has a profile similar to the one described as typical for the series except that the surface layer and the upper part of the subsoil are loamy coarse sand and the gray layer, just below the thin black surface mat, is 1 inch or less in thickness.

Limitations for most nonfarm uses, except those for which large level tracts are needed, are slight. The establishment and maintenance of vegetation is difficult because this soil is droughty. (Capability unit IVs–9)

Carver loamy coarse sand, 8 to 15 percent slopes (CbC).—This soil occupies short slopes along the edges of moraines in the southeastern part of the county. It has a profile like the one described as typical for the series except that the surface layer and the upper part of the subsoil are loamy coarse sand. It is underlain by deep deposits of coarse sand.

This soil is poorly suited to crops, hay, or pasture because of droughtiness and slope. Its most practical use is woodland.

Droughtiness and slope impose moderate to severe limitations on the use of this soil for most nonfarm purposes. (Capability unit VIIs–9)

Carver and Gloucester soils, 8 to 35 percent slopes (CcD).—These soils occupy moraines in the southeastern part of the county. Sandy Carver soils make up about two-thirds of this unit, and extremely stony Gloucester soils make up the rest. These soils were mapped as a unit because of their irregular and complex slopes. They are not suited to farming.

The most practical uses for these soils are woodland and recreation areas. (Capability unit VIIs–9)

Charlton Series

The Charlton series consists of deep, well-drained, gently sloping to moderately steep soils that formed in glacial till that contains much phyllite. These soils occur in the northern part of the county. Most of the acreage is wooded, principally with oak, white pine, beech, and birch.

In wooded areas, there is a thin surface layer of black fine sandy loam. Below this is 4 or 5 inches of dark-brown fine sandy loam that is very friable and contains many roots. This material is underlain to a depth of about 2 feet by fine sandy loam that is yellowish brown in the upper part and light yellowish brown in the lower part. Roots and small rock fragments are common in this underlying material. The substratum is light olive-brown gravelly sandy loam. It contains many small rock fragments but few roots.

In some places, the surface layer is very fine sandy loam.

In Plymouth County, Charlton soils are the deeper soils in areas where bedrock crops out. They are closely associated with the shallow Hollis soils. Because the individual areas of both soils are small, Charlton soils were mapped as a complex with Hollis soils.

Deerfield Series

The Deerfield series consists of level to gently sloping, moderately well drained soils that formed in thick deposits of sand. These soils occupy the low-lying parts of sandy outwash plains throughout the county. Most areas are small.

In cultivated fields, the plow layer is dark-brown sandy loam about 8 inches thick. The subsoil is a yellowish-brown loamy sand about 18 inches thick. The lower part of the subsoil is mottled with yellowish red as a result of periodic saturation. The substratum is grayish-brown sand. It contains a few pebbles, but there are no gravelly layers within 3½ feet of the surface.

Undrained areas are suited to hay and pasture. Drained areas can be used for early truck crops.

If the water table is lowered, these soils are likely to be droughty because of their coarse texture and low organic-matter content. Supplemental irrigation is then needed.

Deerfield sandy loam, 0 to 3 percent slopes (DeA).—This soil has the profile described as typical for the series. Included in the areas mapped are small areas of a gently sloping soil and some areas in which the soil is underlain by sand and gravel.

During wet periods, this soil is saturated to within 2 feet of the surface by a fluctuating water table. In some places, it receives surface runoff from higher lying soils. It is suited to most crops commonly grown in the county, but it remains wet until late in spring.

There are moderate or severe limitations for most nonfarm uses. (Capability unit IIIw-9)

Deerfield sandy loam, 3 to 8 percent slopes (DeB).—This soil is underlain by deep deposits of sand. It occupies narrow edges along drainageways on outwash plains.

This soil is saturated to within 2 feet of the surface late in winter and in spring. Undrained areas are suitable for hay or pasture. Drained areas can be used for row crops if rows are run across the slope.

There are moderate or severe limitations for most nonfarm uses. (Capability unit IIIw-9)

Dune Land and Coastal Beach

Dune land and Coastal beach (Du) is a land type consisting of highly quartzitic sand adjacent to the seashore. The individual sand particles have been rounded by the combined action of waves and wind. These areas are continually changing in shape and size. Most beaches have a zone of erosion, from which sand is being removed, and a zone of accretion, on which sand is being deposited both by waves and by longshore currents. Dunes form when beach sand is swept up by wind and dropped on the leeward side of beaches. The dunes have characteristic billowy topography. Some are partially stabilized by beach plum, bayberry, and other hardy shrubs. This land type adds greatly to the recreational resources of Plymouth County. (Capability unit VIIIs-2)

Enfield Series

The Enfield series consists of well-drained soils that formed in very fine sand deposited by wind over coarse sand and gravel. Small areas of Enfield soil are scattered through the southeastern part of the county. Most of the acreage is wooded with pitch pine and scrub oak.

In wooded areas, there is a thin layer of gray mineral material beneath the forest litter. This is underlain by very friable, dark-brown very fine sandy loam. This texture is exceptionally uniform to a depth of about 2½ feet, but the dark-brown color gradually fades to light yellowish brown. The underlying substratum consists of very pale brown to gray coarse sand and gravel.

In some places, a few cobblestones are scattered on and throughout the surface layer. The cobblestones are ventifacts, which characteristically have irregular, wavelike, buffed surfaces caused by sandblasting. Water moves at a moderate rate through the solum and rapidly through the underlying coarse sand and gravel.

Enfield soils are easily worked and are well suited to most of the crops commonly grown in the county. During an average growing season, crops need supplemental irrigation. These soils have few limitations for most nonfarm uses.

Enfield very fine sandy loam, 0 to 3 percent slopes (EnA).—This soil occurs on the plains in the southeastern part of the county. It has the profile described as typical for the series. It is underlain by coarse sand and gravel.

This soil is well suited to the crops commonly grown in the county, but crops may need supplemental irrigation during some growing seasons. Water erosion is not a hazard, but wind erosion is likely to occur if the surface is left bare. Cover crops should be grown to protect the soil and to maintain the organic-matter content.

There are few limitations for most nonfarm uses. Vegetation is easy to establish and to maintain. (Capability unit I-5)

Enfield very fine sandy loam, 3 to 8 percent slopes (EnB).—This soil occupies small areas on the plains in the southeastern part of the county. It is underlain by sand and gravel.

This soil is well suited to the crops commonly grown in the county. It is susceptible to both water and wind ero-

sion. Limitations on the use of this soil for most nonfarm purposes are slight. (Capability unit IIe-5)

Enfield very fine sandy loam, 8 to 15 percent slopes (EnC).—This soil occupies small areas near moraines in the southeastern part of the county. It is underlain by sand and gravel.

This soil is suited to most crops commonly grown in the county, but intensive conservation measures are needed to help control erosion.

Slope limits the use of this soil for many nonfarm purposes. A concentration of runoff from roofed or paved areas results in rapid formation of gullies. (Capability unit IIIe-5)

Essex Series

The Essex series consists of level to moderately steep, well-drained soils that formed in firm glacial till. These soils occupy ground moraines and smooth rounded hills, called drumlins, chiefly in the central and western parts of the county. In their natural state, Essex soils are very stony or extremely stony. About a third of the acreage has been cleared of stones and boulders.

The plow layer in cultivated areas consists of about 8 inches of dark-brown to brown coarse sandy loam. It is loose and crumbly. The upper part of the subsoil, to a depth of about 11 inches, is strong-brown gravelly coarse sandy loam, and the lower part is yellowish-brown gravelly loamy coarse sand. At a depth of about 2 or 2½ feet is a fragipan of sandy loam. If removed, this material shatters into small clods or into flat, platelike pieces.

Water moves readily through the soil material above the fragipan but slowly through the fragipan. During periods of extended rainfall, the part above the fragipan becomes saturated. The water then seeps laterally downslope, above the fragipan. Normally, sufficient moisture is available for good plant growth.

Essex coarse sandy loam, 0 to 3 percent slopes (EsA).—This soil has the profile described as typical for the series. It occurs mainly in the central and western parts of the county. Included in the areas mapped are small areas of fine sandy loam and small pockets of moderately well drained soils.

This soil is suited to most of the crops commonly grown in the county. It is well suited to hay and pasture. The moisture supply is ample during normal seasons. Erosion is only a slight hazard. Nevertheless, winter cover crops are needed to help maintain the organic-matter content and to preserve good tilth.

The slowly permeable fragipan retards leaching, but it also imposes severe limitations for many nonfarm uses for which onsite sewage disposal is required. (Capability unit I-2)

Essex coarse sandy loam, 3 to 8 percent slopes (EsB).—This soil occurs on ground moraines, mainly in the central and western parts of the county. It is underlain by compact glacial till. Small pockets of a moderately well drained soil are included in the areas mapped.

This soil is suitable for the crops commonly grown in the county, and especially for silage corn and hay.

The slowly permeable fragipan imposes severe limitations for most nonfarm uses. (Capability unit IIe-2)

Essex coarse sandy loam, 8 to 15 percent slopes (EsC).—This soil occurs mainly in the central and western parts of the county. It is underlain by compact glacial till. Included in the areas mapped are a few small areas of loamy sand.

This soil retains moisture well and is not readily leached of plant nutrients. It is suitable for hay or pasture. If row crops are grown, intensive conservation practices are needed to help control erosion.

There are severe limitations for most nonfarm uses because of the slowly permeable fragipan. (Capability unit IIIe-2)

Essex very stony coarse sandy loam, 3 to 8 percent slopes (EtB).—This soil is underlain by compact glacial till. Stones on the surface are generally between 1 and 3 feet in diameter and are from 20 to 80 feet apart. Included in the areas mapped are small areas of fine sandy loam.

This soil is productive of hay or pasture if limed, fertilized, and reseeded. The fragipan retards the loss of plant nutrients through leaching.

The slowly permeable fragipan imposes severe limitations for most nonfarm uses. (Capability unit VIs-2)

Essex very stony coarse sandy loam, 8 to 15 percent slopes (EtC).—This soil is underlain by compact glacial till. Stones on the surface are generally between 1 and 3 feet in diameter and are about 20 to 80 feet apart. In some places, the surface layer is lighter colored and the compact till is closer to the surface than in a typical profile.

This soil is productive of hay and pasture if applications of lime and fertilizer are adequate. The fragipan retards leaching of plant nutrients.

The slowly permeable fragipan imposes severe limitations for many nonfarm uses. Slope and stoniness are additional limiting features. (Capability unit VIs-2)

Essex very stony coarse sandy loam, 15 to 25 percent slopes (EtD).—This soil is underlain by compact glacial till. Stones on the surface are generally between 1 and 3 feet in diameter and are from 20 to 80 feet apart. In some places. the surface layer is lighter colored and the compact till is closer to the surface than in a typical profile. Small areas of a steeply sloping soil are included in the areas mapped.

This soil is productive of hay and pasture if applications of lime and fertilizer are adequate. Stoniness and slope make the growing of row crops impractical.

The slowly permeable fragipan and the slope impose limitations for most nonfarm uses. (Capability unit VIs-2)

Essex extremely stony coarse sandy loam, 3 to 8 percent slopes (EuB).—The surface layer of this soil is black and is 1 to 2 inches thick. It is underlain by 6 to 8 inches of strong-brown coarse sandy loam. Otherwise, the profile is similar to the one described as typical for the series. Stones and boulders on the surface are between 1 and 3 feet in diameter and are from 2 to 20 feet apart. Included in the areas mapped are small pockets of a moderately well drained, extremely stony soil; a few small areas of a nearly level soil; and small areas of fine sandy loam.

This soil can be used for native pasture, but it is better suited to woodland and wildlife habitat. Lime and fertilizer will promote the growth of legumes.

There are limitations for most nonfarm uses because of the slowly permeable fragipan and the many stones and boulders. (Capability unit VIIs-2)

Essex extremely stony coarse sandy loam, 8 to 25 percent slopes (EuC).—The surface layer of this soil is black and is from 1 to 2 inches thick. It is underlain by 6 to 8 inches of strong-brown coarse sandy loam. Otherwise, the profile is similar to the one described as typical for the series. Stones on the surface are between 1 and 3 feet in diameter and are from 2 to 20 feet apart. Small areas of a steep soil are included in the areas mapped.

Extreme stoniness and slope limit the use of this soil to native pasture and woodland.

The use of this soil for most nonfarm purposes is limited because of the slope and the slowly permeable fragipan. (Capability unit VIIs–2)

Fresh Water Marsh

Fresh water marsh (Fr) consists of continuously flooded areas that contain little open water. It supports a dense growth of cattails, rushes, sphagnum moss, and other aquatic vegetation. Many areas of fresh water marsh are adjacent to reservoirs used to flood cranberry bogs. Fresh water marsh provides habitat for waterfowl and wetland animals. (Capability unit VIIIw–1)

Gloucester Series

The Gloucester series consists of level to steep, somewhat excessively drained and well-drained soils that formed in glacial till derived chiefly from granite. These soils occur mostly on the higher parts of rolling ground moraines. Most of the acreage is wooded with white pine, pitch pine, or oak.

In wooded areas, there is a thin surface layer of dark gray, sandy mineral material. The upper part of the subsoil is dark yellowish-brown loamy sand or sandy loam. The lower part is brownish-yellow loamy sand. The substratum, at a depth of about 2 feet, is light-gray gravelly loamy sand. There are many subangular rock fragments of all sizes scattered throughout the soil material. In some places, the substratum has a firm layer at a depth of about 2½ to 5 feet.

Gloucester soils are extremely stony except where they have been cleared for tillage.

Gloucester fine sandy loam, firm substratum, 0 to 3 percent slopes (GaA).—This soil occurs as small areas throughout the county. It is well drained. The plow layer consists of fine sandy loam about 8 inches thick, and in most places there is a firm layer at a depth of 2½ to 5 feet. Otherwise, the profile is similar to the one described as typical for the series. A few small areas of a moderately well drained soil are included in the areas mapped.

This soil is suited to the crops commonly grown in the county. It is productive if adequate amounts of lime and fertilizer are used.

There are limitations for most nonfarm uses that require an onsite sewage disposal system. (Capability unit I–3)

Gloucester fine sandy loam, firm substratum, 3 to 8 percent slopes (GaB).—This soil occurs as small scattered areas, mainly in the southwestern part of the county. It is well drained. The plow layer consists of fine sandy loam about 8 inches thick, and in most places there is a firm layer at a depth of 2½ to 5 feet. Otherwise, the profile is similar to the one described as typical for the series.

This soil is suited to the crops commonly grown in the county. The response to fertilizer and lime is good.

The moderately slowly to slowly permeable substratum limits the use of this soil for most nonfarm purposes that require onsite sewage disposal systems. (Capability unit IIe–3)

Gloucester fine sandy loam, firm substratum, 8 to 15 percent slopes (GaC).—This soil occurs as small scattered areas, mainly in the southwestern part of the county. It is well drained. The plow layer consists of fine sandy loam about 8 inches thick, and in most places there is a firm layer at a depth of 2½ to 5 feet. Otherwise, the profile is similar to the one described as typical for the series. Included in the areas mapped are a few small areas of a strongly sloping soil.

If this soil is used for row crops, intensive conservation measures are needed to help control erosion.

There are limitations for most nonfarm uses because of the slope and the underlying firm substratum. (Capability unit IIIe–3)

Gloucester loamy sand, 0 to 3 percent slopes (GbA).—This soil occurs as small scattered areas, chiefly in the eastern and southwestern parts of the county. It is somewhat excessively drained. The plow layer consists of loamy sand about 8 inches thick, and in a few places there is a firm layer at a depth of 2½ to 5 feet. Otherwise, the profile is similar to the one described as typical for the series. Included in the areas mapped are small pockets of a moderately well drained soil.

This soil is suited to the crops commonly grown in the county, but crops generally require supplemental irrigation. (Capability unit IIIs–9)

Gloucester loamy sand, 3 to 8 percent slopes (GbB).—This soil occurs as scattered areas, mainly in the eastern and southwestern parts of the county. It is somewhat excessively drained. The plow layer consists of loamy sand about 8 inches thick, and in a few places there is a firm layer at a depth of 2½ to 5 feet. Otherwise, the profile is similar to the one described as typical for the series.

If this soil is used for row crops, supplemental irrigation is needed and intensive conservation measures should be taken to control erosion. Plant nutrients are leached out rapidly unless a large amount of organic matter is added. (Capability unit IIIs–9)

Gloucester loamy sand, 8 to 15 percent slopes (GbC).—This soil occurs as small areas, mainly in the eastern and southwestern parts of the county. It is somewhat excessively drained. The plow layer consists of loamy sand about 8 inches thick, and in a few places a firm layer occurs at a depth of 2½ to 5 feet. Otherwise, the profile is similar to the one described as typical for the series. A few small areas of a strongly sloping soil are included in the areas mapped.

If row crops are grown, contour tillage should be used to control erosion. Large amounts of organic matter are needed to limit the loss of plant nutrients through leaching and to increase the moisture-holding capacity. Irrigation is needed during most growing seasons.

The slope imposes limitations for most nonfarm uses. Vegetation is somewhat difficult to establish and to maintain. (Capability unit IVs–9)

Gloucester very stony fine sandy loam, firm substratum, 3 to 8 percent slopes (GcB).—This soil occurs as scattered areas throughout the western half of the county. It is well drained. In most places there is a firm

layer at a depth of 2½ to 5 feet. Stones on the surface are between 1 and 3 feet in diameter and are from 20 to 80 feet apart. Small areas of a nearly level soil are included in the areas mapped.

This soil is productive of hay and pasture if lime and fertilizer are applied.

There are moderate limitations for most nonfarm uses and severe limitations for uses that require onsite sewage disposal systems. (Capability unit VIs–8)

Gloucester very stony fine sandy loam, firm substratum, 8 to 15 percent slopes (GcC).—This soil occurs as scattered areas, mainly in the western half of the county. It is well drained. Stones on the surface are generally between 1 and 3 feet in diameter and from 20 to 80 feet apart. In most places there is a firm layer at a depth of 2½ to 5 feet.

The use of this soil for row crops is impractical because of the stones. This soil can be used for hay and pasture if it is reseeded regularly and if adequate amounts of lime and fertilizer are applied.

Stoniness, slope, and a firm substratum limit the use of this soil for most nonfarm purposes. (Capability unit VIs–8)

Gloucester very stony fine sandy loam, firm substratum, 15 to 25 percent slopes (GcD).—This is a well-drained soil that has a firm layer at a depth of 2½ to 5 feet. Stones on the surface are between 1 and 3 feet in diameter and are from 20 to 80 feet apart. The total acreage is small. Included in the areas mapped are a few small areas of a steeply sloping soil.

The use of this soil for row crops is impractical because of the slope and stones. This soil produces some pasture if adequate amounts of lime and fertilizer are applied.

Slope, stoniness, and a moderately slowly permeable substratum impose limitations for most nonfarm uses. (Capability unit VIs–8)

Gloucester very stony loamy sand, 3 to 8 percent slopes (GdB).—This soil occurs throughout the eastern and southwestern parts of the county. Stones on the surface are between 1 and 3 feet in diameter and are from 20 to 80 feet apart. In a few places there is a firm layer at a depth of 2½ to 5 feet. Small areas of a nearly level soil are included in the areas mapped.

This soil is too stony to be used for row crops. Although droughty, it can be used for hay and pasture. The loss of plant nutrients through leaching can be reduced if fertilizer is applied frequently in small amounts.

Stones and boulders limit the use of this soil for most nonfarm purposes. (Capability unit VIs–8)

Gloucester very stony loamy sand, 8 to 15 percent slopes (GdC).—This soil occurs as small scattered areas, mainly in the eastern and southwestern parts of the county. Stones on the surface are generally between 1 and 3 feet in diameter and from 20 to 80 feet apart. In a few places there is a dense layer at a depth of 2½ to 5 feet. Small areas of a moderately steep soil are included in the areas mapped.

This soil is too stony to be used for row crops. Although droughty, it can be used for pasture if limed and fertilized. Loss of plant nutrients through leaching can be reduced if fertilizer is applied frequently in small amounts.

Stoniness and slope impose moderate to severe limitations for most nonfarm uses. (Capability unit VIs–8)

Gloucester extremely stony loamy sand, 3 to 15 percent slopes (GeB).—This soil occurs as scattered areas throughout the county. Stones on the surface are generally between 1 and 3 feet in diameter and from 2 to 10 feet apart. Included in the areas mapped are small areas of fine sandy loam.

This soil produces fairly good stands of white pine and of hardwoods through natural reseeding.

Stones and slope limit the use of this soil for most nonfarm purposes. (Capability unit VIIs–2)

Gloucester extremely stony loamy sand, 15 to 35 percent slopes (GeD).—This soil occurs as small scattered areas, mainly in the southeastern and southwestern parts of the county. Stones on the surface are generally between 1 and 3 feet in diameter and from 2 to 10 feet apart. Included in the areas mapped are small areas of fine sandy loam.

Farming this soil is impractical because of the stones and the slope. Fairly good stands of white pine and of hardwoods are produced through natural reseeding.

Stones and slope also limit the use of this soil for most nonfarm purposes. (Capability unit VIIs–2)

Hinckley Series

The Hinckley series consists of droughty, level to steep gravelly soils that formed in thick deposits of water-sorted sand and gravel. These soils are most prevalent in the central and western parts of the county. They occur mainly on plains or terraces, but some are on hummocky kames or on sinuous esker ridges. Most areas are now wooded, but in the past these areas were cleared and used for hay or pasture.

In wooded areas that were formerly cultivated, the organic litter is underlain by a gray mineral layer less than 1 inch thick. Below this, to about plow depth, is brown gravelly loamy sand. The subsoil is yellowish-brown gravelly loamy sand. It is underlain abruptly at a depth of about 18 inches by sand, gravel, and cobblestones. In many places this material is stratified. Gravel and cobblestones make up about two-thirds or more of the substratum.

The surface layer is about 25 percent gravel, by volume. In some places there are cobblestones on the surface.

These soils are low in moisture-holding capacity and are low in organic-matter content. Some areas are used for cultivated crops. Crops generally need to be irrigated.

Hinckley gravelly loamy sand, 0 to 3 percent slopes (HaA).—This soil is on plains in the central and western parts of the county. Included in the areas mapped are some areas in which the surface layer is sandy loam and the layer of coarse sand and gravel is less than 18 inches from the surface.

Alfalfa grows fairly well on this soil if adequate amounts of lime and fertilizer are applied. If management is good, early truck crops can be grown. Irrigation is necessary during most growing seasons.

The limitations for most nonfarm uses are slight. There are many large, level tracts; water moves downward very rapidly through the coarse substratum; and the underlying sand and gravel are a good source of porous fill. Vegetation is somewhat difficult to maintain because this soil is droughty. (Capability unit IIIs–9)

Hinckley gravelly loamy sand, 3 to 8 percent slopes (HaB).—This soil is on undulating plains in the central and western parts of the county. Most slopes are short and

irregular. Small areas in which the surface layer is sandy loam and the layer of sand and gravel is less than 18 inches from the surface are included in the areas mapped.

Alfalfa grows fairly well on this soil. Row crops can be grown if intensive conservation measures are taken to maintain the organic-matter content and to control erosion. Irrigation is necessary during most growing seasons.

Except for those uses that require a large level tract, the limitations for most nonfarm uses are slight. Water percolates rapidly through the underlying sand and gravel. Vegetation is somewhat difficult to establish and to maintain because this soil is droughty. (Capability unit IIIs–9)

Hinckley gravelly loamy sand, 8 to 15 percent slopes (HaC).—This soil occurs throughout the central and western parts of the county. Most slopes are short and irregular.

If row crops are grown, erosion is a serious hazard because the slopes are not suited to contour tillage. Large amounts of organic matter are needed to limit the loss of plant nutrients through leaching and to increase the moisture-holding capacity. Irrigation is needed during most growing seasons.

The slope imposes limitations for most nonfarm uses. Vegetation is somewhat difficult to establish and to maintain. The underlying layer of sand and gravel is a good source of porous fill. (Capability unit IVs–9)

Hinckley gravelly loamy sand, 15 to 35 percent slopes (HaE).—This soil occurs on terrace escarpments, on eskers, and on some kames.

Slope and droughtiness severely limit the use of this soil for crops or pasture and for most nonfarm purposes. The most practical use for this soil is woodland. The underlying sand and gravel is a good source of porous fill. (Capability unit VIIs–9)

Hollis Series

The Hollis series consists of gently sloping to moderately steep, somewhat excessively drained soils that formed in glacial till that contained many particles of granite, gneiss, and phyllite. These soils are shallow over bedrock and occur in areas in which there are many outcrops of bedrock. They are chiefly in the northern part of the county.

In wooded areas the surface layer is dark yellowish-brown fine sandy loam. The subsoil is yellowish-brown fine sandy loam. Both layers are friable. Bedrock commonly is at a depth of 15 to 20 inches. It is generally fine-grained igneous rock.

Scattered stones and boulders occur on the surface. In some places the subsoil has a sandy loam texture and is 10 to 30 percent subangular rock fragments.

Hollis soils are intermingled with Charlton soils, which are deeper over bedrock.

Hollis-Charlton fine sandy loams, 3 to 8 percent slopes (HoB).—These soils are in areas where there are a few outcrops of bedrock. They are intermingled and are managed together. The Charlton soil is deep and well drained, and the Hollis soil is shallow and somewhat excessively drained.

These soils are suitable for the crops commonly grown in the county. Shallowness to bedrock is a limitation for many nonfarm uses. (Capability unit IIe–7)

Hollis-Charlton very rocky fine sandy loams, 3 to 15 percent slopes (HpC).—These soils occur mainly in the northern part of the county, in areas where there are outcrops of bedrock. They are closely intermingled. The Charlton soil is deep and well drained, and the Hollis soil is shallow and somewhat excessively drained.

These soils provide some unimproved pasture. The stones, boulders, and outcrops are too numerous for tillage to be practical.

Shallowness to bedrock is a severe limitation for most nonfarm uses. (Capability unit VIs–7)

Hollis-Charlton extremely rocky fine sandy loams, 3 to 15 percent slopes (HrC).—These soils are interspersed with many large outcrops of bedrock. The Charlton soil is deep and well drained, and the Hollis soil is shallow and somewhat excessively drained.

The many large outcrops limit the use of these soils mainly to woodland. There are some fairly good stands of white pine and hardwoods, but the harvesting of timber is difficult because of the boulders, stones, and outcrops. Some areas provide good habitat for wildlife.

The limitations for most nonfarm uses are severe because of the many outcrops. (Capability unit VIIs–7)

Hollis-Charlton extremely rocky fine sandy loams, 15 to 25 percent slopes (HrD).—These soils contain many outcrops of bedrock. The Charlton soil is deep and well drained, and the Hollis soil is shallow and somewhat excessively drained. Most areas are very stony or extremely stony.

The numerous outcrops limit the use of these soils mainly to woodland. There are some fairly good stands of white pine and hardwoods, but the harvesting of timber is difficult because of the many stones, boulders, and outcrops. Some areas provide good habitat for wildlife, and there are areas that should be preserved for their scenic value.

The limitations for most nonfarm uses are severe because of the many outcrops. (Capability unit VIIs–7)

Made Land

Made land (Ma) consists of areas that have been filled with earth or with cinders and other rubble. Most areas are in the northern half of the county, adjacent to industrial or commercial areas or residential developments. Because of the variable nature of the land, no capability classification has been made. Onsite investigation is necessary to determine the capability or the limitations of the individual areas.

Merrimac Series

The Merrimac series consists of level to steep, well-drained to excessively drained soils that formed in sand and gravel. These soils are free of stones. The largest areas are on the higher parts of plains and terraces.

In wooded areas, about an inch of decomposed organic litter overlies a thin layer of very dark gray sandy loam. The subsoil is yellowish-brown sandy loam in the upper part and light yellowish-brown gravelly loamy sand in the lower part. At a depth of about 2½ feet, it is underlain abruptly by coarse sand and gravel that in most places is stratified.

Merrimac soils are very friable and are easy to dig with a spade. Although they are free of large stones, in some areas they have pebbles and a few cobblestones in the surface layer and subsoil. The depth to coarse sand and gravel ranges from 1½ to 3 feet but is commonly about

2 to 2½ feet. Water moves rapidly through this coarse-textured material.

These soils dry out early in spring and shortly after heavy rains. Some areas are used for market garden crops or silage corn, but most areas are wooded.

Merrimac fine sandy loam, 0 to 3 percent slopes (MeA).—This soil occurs mainly in the central part of the county. It is well drained and has the profile described for the series. Some areas are large.

Permeability is moderately rapid to rapid, and the moisture-holding capacity is moderate. Water moves rapidly downward through the underlying sand and gravel.

This soil dries out early in spring and is easily worked. It can be used intensively for crops. It is suitable for corn, forage crops, and all the truck crops commonly grown in the county. It is well suited to alfalfa. In most years irrigation of truck crops is needed.

The limitations for most nonfarm uses are slight. (Capability unit I–5)

Merrimac fine sandy loam, 3 to 8 percent slopes (MeB).—This soil occurs on plains and terraces in the central part of the county. It has a profile like the one described for the series except that in some places the lower part of the subsoil is loamy sand.

Permeability is moderately rapid to rapid, and the moisture-holding capacity is moderate. Water moves rapidly downward through the underlying sand and gravel.

This soil dries out early in spring and is easily worked. It can be used intensively for crops. It is suited to corn, forage crops, and all of the truck crops commonly grown in the county. It is well suited to alfalfa. In most years irrigation is needed for optimum yields of truck crops.

There are only slight limitations for most nonfarm uses. (Capability unit IIe–5)

Merrimac fine sandy loam, 8 to 15 percent slopes (MeC).—This soil is well drained. It has a profile like the one described for the series except that in some places the lower part of the subsoil is loamy sand.

Permeability is moderately rapid to rapid, and the moisture-holding capacity is moderate. Water moves rapidly downward through the underlying sand and gravel.

This soil dries out early in spring and is easily worked. It is suitable for corn, forage crops, and all of the truck crops commonly grown in the county. It is well suited to alfalfa. Irrigation of truck crops is needed in most years. Because of its slope, rapid runoff, and moderately coarse texture, this soil is highly susceptible to erosion if cultivated. Measures are needed to control erosion.

Slope limits the use of this soil for most nonfarm purposes. (Capability unit IIIe–5)

Merrimac sandy loam, 0 to 3 percent slopes (MfA).—This soil is on plains and terraces. It is underlain by deep deposits of stratified sand and gravel.

Permeability is moderately rapid to rapid, and the water-holding capacity is moderate to low.

This soil is suited to most row crops and to alfalfa and other forage crops. In most years irrigation is needed if row crops are grown.

There are only slight limitations for most nonfarm uses. Vegetation is difficult to establish and to maintain because this soil is droughty. (Capability unit IIs–8)

Merrimac sandy loam, 3 to 8 percent slopes (MfB).—This soil is on terraces. It is underlain by deep deposits of stratified sand and gravel.

Permeability is very rapid to rapid, and the moisture-holding capacity is moderate to low.

This soil is suited to most row crops and to alfalfa and other forage crops. Irrigation is needed in most years if row crops are grown.

Vegetation is difficult to establish and to maintain on lawns or recreation areas because this soil is droughty. (Capability unit IIs–8)

Merrimac sandy loam, 8 to 15 percent slopes (MfC).—This soil is on terraces, kames, and eskers. It is underlain by deep deposits of stratified sand and gravel.

Although water moves rapidly downward through this soil, unprotected slopes are subject to erosion.

This soil is suited to pasture and hay, including alfalfa. In most years irrigation is needed.

The slope imposes limitations for most nonfarm uses. The coarse substratum is a good source of sand and gravel. (Capability unit IIIe–8)

Merrimac sandy loam, 15 to 35 percent slopes (MfE).—This soil occurs on escarpments at the edge of terraces or along drainageways, mainly in the central part of the county. It is underlain by stratified sand and gravel. In some places the lower part of the subsoil is loamy sand.

The slope limits the use of this soil, both for farming and for most nonfarm purposes. Slopes of more than 25 percent should be kept in woodland. Woodland roads and skidways must be carefully located to prevent surface water from concentrating and causing washouts. White pine establishes itself by natural seeding, and competition from hardwoods is not great. The coarse substratum is a good source of sand and gravel. (Capability unit IVe–8)

Muck

Muck consists of very poorly drained soils that formed in an accumulation of organic material decomposed to the extent that the original plant material cannot be readily identified. These soils are extensive throughout the county. They occupy low areas or depressions that receive surface runoff from nearby higher lying areas. The water table is at or near the surface throughout much of the year.

The surface layer consists of 2 to 4 inches of leaves and twigs that generally are slightly decayed. Below this is dark reddish-brown to black decayed organic material that is from 1 foot to many feet thick. This material is easily dug with a spade. In places it is granular. It is underlain by mineral material similar to that in the substratum of nearby mineral soils.

Most areas of Muck are slightly less than 2½ feet thick, but some are more than 12 feet. Much of the acreage is wooded, mainly with red maple.

Many areas of Muck have been developed for cranberry production. These areas are described under the heading "Sanded Muck."

Muck, shallow (Mu).—This soil occurs as broad, low-lying areas throughout the county. It is from 12 to 30 inches thick. Many areas are underlain by sand or by sand and gravel. A few areas contain large boulders that rest on the underlying mineral material and protrude through the organic layer.

This soil is extremely acid. It is saturated most of the year and is difficult to drain well enough to be suitable for the common crops. It is well suited to wildlife uses, and many tracts are suitable for development as habitat for waterfowl. (Capability unit VIIw-1)

Muck, deep (Mv).—This soil ranges in thickness from 30 inches to many feet.

The soil is saturated most of the year, and it is difficult to drain. It is suitable for development as habitat for waterfowl. (Capability unit VIIw-1)

Ninigret Series, Silty Subsoil Variant

The Ninigret series, silty subsoil variant, consists of nearly level and gently sloping, moderately well drained sandy loams underlain by silt and very fine sand. These soils occupy old glacial lakebeds along the Taunton River and its main tributaries, chiefly in the west-central part of the county.

In cultivated areas, the plow layer is friable, very dark grayish-brown sandy loam about 6 inches thick. The upper part of the subsoil is strong-brown sandy loam. The lower part is paler in color and is mottled with strong brown. The substratum, at a depth of about 2 feet, is mottled, gray to light-gray silt and very fine sand that is firm in place.

These soils dry out late in spring and are waterlogged for short periods after heavy rains. The underlying compact layer of silt and very fine sand is moderately slowly or slowly permeable. Once the soil above this compact layer becomes saturated, the water tends to move downslope along the top of this layer.

Ninigret sandy loam, silty subsoil variant, 0 to 3 percent slopes (NnA).—This soil occurs in scattered areas along the Taunton River and its tributaries. In some places the underlying compact layer is very fine sand instead of silt and very fine sand.

This soil tends to be wet and to remain wet until late in spring. It is well suited to forage crops but needs to be drained if row crops are grown. The underlying compact layer retards the leaching of plant nutrients. Water moves along the top of this compact layer and forms seep spots in some places. (Capability unit IIw-5)

Ninigret sandy loam, silty subsoil variant, 3 to 8 percent slopes (NnB).—This soil occurs as small areas along the Taunton River and its tributaries. In some places the underlying compact layer is very fine sand instead of silt and very fine sand. Included in the areas mapped are a few small areas of a moderately sloping soil.

This soil tends to be wet and to remain wet until late in spring. It is well suited to forage crops but needs to be drained if row crops are grown. The underlying compact layer retards the leaching of plant nutrients. (Capability unit IIw-5)

Norwell Series

The Norwell series consists of level to gently sloping, poorly drained sandy loams that formed in firm glacial till that contains many granitic stones and boulders. These soils have a fragipan at a depth of about 2 feet. They occupy concave slopes or the low parts of ground moraines in all parts of the county except the southeastern part. In their natural state, they are very stony or extremely stony. Most areas are wooded, but some are used for pasture and hay.

In cultivated areas, the plow layer consists of 7 to 10 inches of very dark grayish-brown sandy loam that contains many rock fragments. The underlying layer to a depth of about 20 inches is a grayish-brown to dark grayish-brown loamy sand that becomes lighter gray in the lower part. There are many reddish-yellow and yellowish-red mottles throughout this layer. Below this is a fragipan of firm, grayish, mottled gravelly loamy sand or sandy loam.

In wooded areas, the surface layer is black sandy loam about 4 inches thick. In some places the surface layer and the underlying layer are somewhat finer textured than those described. The depth to the fragipan ranges from about 15 to 24 inches.

These soils are limited in use because of wetness. They have a high water table for 7 months or more each year, and they receive surface runoff and seepage water from nearby slopes. The fragipan restricts the downward movement of water. In some places natural outlets for surface drainage are inadequate or are lacking.

Norwell sandy loam, 0 to 3 percent slopes (NoA).—This soil occupies many small, low areas on gently rolling ground moraines in the western and northern parts of the county. Small areas of fine sandy loam are included in the areas mapped.

This soil is wet for 7 to 9 months of the year because of a high water table. Seepage and runnoff from nearby slopes remain ponded in depressions for short periods. The fragipan restricts the downward movement of water through the soil.

Undrained areas are limited in use to low-quality meadow and pasture or to woodland. Drained areas can be used for improved meadow and pasture. Some areas can be drained enough to be used for silage corn.

Wetness and the fragipan limit the use of this soil for most nonfarm purposes. (Capability unit IVw-9)

Norwell sandy loam, 3 to 8 percent slopes (NoB).—This soil occupies the lower part of gently rolling ground moraines in the northern and western parts of the county. Small areas of fine sandy loam are included in the areas mapped.

This soil is wet for 7 to 9 months each year because the water table is at or near the surface. Seepage and runoff from nearby slopes remain ponded in depressions for short periods. The fragipan restricts the downward movement of water through the soil.

Undrained areas are limited in use to low-quality meadow and pasture or to woodland. Drained areas can be used for improved meadow and pasture. Some areas can be drained enough to be used for silage corn.

The use of this soil for most nonfarm purposes is limited by wetness and by the fragipan. Drainage outlets are available in most areas. (Capability unit IVw-9)

Norwell extremely stony sandy loam, 0 to 3 percent slopes (NpA).—This soil occupies small, low areas on gently rolling ground moraines in the western and northern parts of the county. The surface layer is very dark gray sandy loam about 4 inches thick. Otherwise the profile is similar to that described for the series. Stones and boulders on the surface are from 2 to 10 feet apart. Some areas of fine sandy loam were included in mapping. Nearly all of the acreage is wooded.

Extreme stoniness and wetness severely limit the use of this soil, both for farming and for nonfarm purposes. The most practical use is woodland. (Capability unit VIIs–23)

Norwell extremely stony sandy loam, 3 to 8 percent slopes (NpB).—This soil occupies small, low areas on gently rolling ground moraines in the western and northern parts of the county. The surface layer is very dark gray sandy loam about 4 inches thick. Otherwise the profile is similar to that described for the series. Stones and bolders on the surface are from 2 to 10 feet apart. Small areas of fine sandy loam are included in the areas mapped.

Extreme stoniness and wetness limit the use of this soil, both for farming and for nonfarm purposes. The water table is at or near the surface for 7 to 9 months each year, and seepage from nearby slopes collects on the surface.

Most areas are wooded. Generally, it is impractical to remove the stones and to install drainage so that crops can be grown. (Capability unit VIIs–23)

Peat

Peat consists of very poorly drained soils that formed in an accumulation of partly decomposed organic material. Plant remains can be readily identified. These soils are level and occupy depressions throughout the county, especially in the southern part. They are saturated much of the year.

Below a 1-inch layer of loose leaves and twigs is a layer of dark reddish-brown, woody or fibrous, partly decomposed organic material. This layer ranges from 1 foot to many feet in thickness but commonly is 8 to 10 feet thick. In many places the underlying mineral material is gray sand and gravel.

Peat varies widely in composition. Many deposits consist mainly of woody remnants, some are fibrous mats of reeds and sedges, others are chiefly sphagnum moss, and some are combinations of all three materials.

In their natural state most peat bogs support stands of red maple. Some bogs are wooded with coastal white-cedar, and a few have a cover of reeds, rushes, and sedges.

Large areas of Peat have been cleared and developed for cranberry production. These are included in the areas described under the heading "Sanded Muck."

Peat (Pe).—This soil occupies large tracts, mainly in the southern part of the county. For most of the year it is saturated, and much of the time water is ponded on the surface.

This soil is severely limited in use, both for farming and for many nonfarm purposes. Even if drained, it can support relatively little weight in comparison with mineral soils. It is suitable for wildlife habitat and for woodland. With special preparation, it can be developed for cranberry production. (Capability unit VIIw–1)

Pittstown Series

The Pittstown series consists of moderately well drained, medium-textured soils that formed in firm, olive glacial till. These soils contain many thin, flat fragments of dark-colored phyllite. They occupy the lower part of smoothly rounded drumlins in the northeastern part of the county. Most areas have been used for crops or pasture, but these areas have reverted to woodland. Recently, urban expansion has been extensive in this part of the county.

In areas that have been tilled, the plow layer is dark-brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish-brown silt loam, and the lower part is olive silt loam mottled with yellowish brown. The substratum, which begins at a depth of about 2 feet, is firm, olive silt loam mottled with strong brown. Even if moist this material is difficult to dig with a shovel. A pick is needed if it is dry. This material breaks into flat plates that shatter if pressure is applied. It contains many, thin, flat fragments of phyllite and a few subangular fragments of granite.

These soils retain moisture well. Water moves slowly through the underlying firm till. Most areas receive seepage from nearby slopes.

Pittstown silt loam, 0 to 8 percent slopes (PtA).—This soil occurs on smoothly rounded drumlins in the northeastern part of the county. It is free of stones, but it is wet generally until late in spring and occasionally in fall because of the slowly permeable fragipan. Where the slope is strongest, the depth to the fragipan is less than 2 feet. Small, poorly drained seep spots are included in the areas mapped.

Wetness limits the use of this soil for row crops. Drainage can be improved by means of tile or by mains and laterals. Drained areas are suitable for silage corn, vegetables, and other crops.

This soil is limited in use for most nonfarm purposes for which onsite sewage disposal systems are needed. (Capability unit IIw–2)

Pittstown very stony silt loam, 3 to 15 percent slopes (PuB).—This soil occupies parts of smoothly rounded drumlins in the northeastern part of the county. Stones on the surface are between 1 and 2 feet in diameter and are from 5 to 50 feet apart. Small seep spots are included in the areas mapped.

Unimproved pastures provide a limited amount of forage. Lime and fertilizer would be beneficial.

The use of this soil for most nonfarm purposes is limited because of wetness and the slowly permeable fragipan. This soil is wet in spring and occasionally in fall and in winter. (Capability unit VIs–22)

Quonset Series

The Quonset series consists of level to steep, excessively drained soils that formed in sand and gravel that contain many particles of dark-colored phyllite. These soils are in the northeastern part of the county. Most slopes are short and complex.

In wooded areas, there is a thin surface layer of black sandy loam. The upper part of the subsoil is yellowish-brown sandy loam, and the lower part is yellowish-brown gravelly loamy sand that contains some scattered pebbles. The substratum, which occurs at a depth of about 15 inches, is a mixture of water-sorted sand and gravel. Particles of dark-colored phyllite make up about 25 percent or more of the substratum.

In places there are cobblestones on the surface and throughout the soil material. The depth to the substratum ranges from 15 to 24 inches. In most places the substratum is stratified.

Droughtiness limits the use of these soils for crops. Some areas are used for market garden crops, but most areas are used for homesites or for woodland.

Quonset sandy loam, 0 to 3 percent slopes (QuA).—This soil occupies a few small areas in the northeastern part of the county.

Water moves very rapidly downward through this soil and through the coarse substratum. Little moisture is retained for plants.

This soil is of limited use for crops or pasture, although it dries out quickly and can be worked early in spring. If cultivated crops are grown, careful management is needed to increase fertility and to maintain or increase the organic-matter content. Irrigation is needed during most growing seasons.

The limitations for most nonfarm uses are slight. Vegetation is difficult to establish and to maintain on lawns or playgrounds because this soil is droughty. (Capability unit IIIs–9)

Quonset sandy loam, 3 to 8 percent slopes (QuB).—This soil occupies small areas in the northeastern part of the county.

Water moves very rapidly downward through this soil and through the coarse substratum. Little moisture is retained for plants.

This soil is of limited use for crops or pasture, although it dries out quickly and can be worked early in spring. If cultivated crops are grown, careful management is needed to increase fertility, to maintain or increase the organic-matter content, and to control erosion. Irrigation is needed during most growing seasons.

The limitations for nonfarm uses, except those for which large level tracts are needed, are slight. Vegetation is difficult to establish and to maintain on this droughty soil. (Capability unit IIIs–9)

Quonset sandy loam, 8 to 15 percent slopes (QuC).—This soil occupies pitted outwash plains in the northeastern part of the county. In some places the surface layer is thinner than that described for the series, and the depth to the substratum is less. In many places there are cobblestones on the surface.

This soil is not well suited to crops or pasture. Irregular slopes generally make erosion control difficult if row crops are grown. Irrigation and frequent applications of fertilizer are needed.

Slope is a limitation for many nonfarm uses. Vegetation is difficult to establish and to maintain because this soil is droughty. (Capability unit IVs–9)

Quonset sandy loam, 15 to 35 percent slopes (QuE).—The profile of this soil is much like that described for the series, but the surface layer is generally thinner and the depth to the coarse substratum is less. Slopes are short and generally irregular.

Droughtiness and slope limit the use of this soil for row crops or pasture. The most practical use is for woodland. The substratum is a good source of sand and gravel.

The slope is a limitation for many nonfarm uses. (Capability unit VIIs–9)

Raynham Series

The Raynham series consists of poorly drained silt loams that formed on marine or glacial lake sediments. These soils occupy small, low flats in the basin of the Taunton River.

In cultivated areas, the plow layer is very dark grayish-brown silt loam. The upper part of the subsoil is a grayish-brown silt loam mottled with yellowish brown. The lower part is a light-gray to brownish-gray silt loam prominently mottled with strong brown. The substratum, which occurs at a depth of about 2 feet, is gray, mottled silt loam or very fine sandy loam. It is firm and is difficult to dig with a spade. If removed, it breaks into large clods.

Raynham soils are saturated for 7 to 9 months each year. Permeability is moderately slow or slow in both the subsoil and the substratum. In some places there are alternating thin layers, or varves, of silt and very fine sand in the substratum.

Raynham silt loam, 0 to 3 percent slopes (RaA).—This soil occupies low flats along the Taunton River and its tributaries. It is saturated for 7 to 9 months each year, chiefly because the water table is high.

Drainage can be improved to some extent by leveling and bedding. Permeability is moderately slow or slow. Thus, tile drainage systems cannot function well.

Undrained areas are suitable for hay or pasture if moisture-tolerant plants are used. Partly drained areas can be used for silage corn and some row crops, but crops will be damaged during extended wet periods. Some areas can be developed as habitat for wetland wildlife. Material used in brick making has been obtained from some areas.

There are severe limitations if this soil is used for septic-tank filter fields or for homesites. (Capability unit IIIw–5)

Saco Series

The Saco series consists of very poorly drained soils that formed in alluvium on flood plains. These soils occur principally in small oxbows or depressions along the Taunton River and its tributaries. Most of the acreage is wooded, chiefly with red maple.

The surface layer is very dark gray or black very fine sandy loam. It is underlain by very dark gray, mottled very fine sandy loam. Below this is gray or light-gray, mottled silt loam.

Saco soils are flooded during wet periods and when streams are high. The water table is near the surface much of the year. Drainage is difficult because there are few suitable outlets.

Saco very fine sandy loam (0 to 3 percent slopes) (Sa).—This soil is subject to flooding. Included in the areas mapped are some areas of fine sandy loam or silt loam.

Frequent flooding and constant wetness limit the use of this soil, both for farming and for nonfarm purposes. Unimproved pastures provide a limited amount of forage late in summer.

This soil is suitable for wetland wildlife habitat and as sites for dug ponds. (Capability unit VIw–6)

Sanded Muck

Sanded muck (Sb) consists of Muck, Peat, and very poorly drained mineral soils that have been developed for cranberry production (fig. 9). All trees and brush have been removed, and the surface has been leveled. About a foot of coarse sand has been spread over the organic material to provide a rooting medium for cranberry vines. Provisions have been made to flood and drain these areas quickly. A network of lateral and perimeter ditches lowers the water level to 1½ feet below the cranberry vines. Water for frost

Figure 9.—**In foreground, commercial cranberry bog on Sanded muck. Network of ditches is used to flood and drain the bog. In background, white pine on Carver coarse sand, 8 to 15 percent slopes.**

protection and overwinter flooding is pumped from reservoirs or ponds or is diverted from streams. Sanded muck is not classified in a capability unit.

Scarboro Series

The Scarboro series consists of very poorly drained sandy loams that formed in thick deposits of sand or sand and gravel. These soils occupy large depressions on outwash plains throughout the county. Most of the acreage is wooded, principally with red maple.

A black mucky layer about 6 inches thick overlies the mineral layer of very dark brown sandy loam, which is about 9 inches thick. Below this is a 5- or 6-inch layer of gray, mottled loamy sand. The substratum is gray sand and is faintly mottled in the upper part.

The mucky layer ranges from 4 to 12 inches in thickness.

Scarboro soils commonly receive surface runoff from higher areas. They are rapidly permeable and can be drained readily if suitable outlets are available.

Scarboro sandy loam, 0 to 3 percent slopes (ScA).—This soil occupies depressions on outwash plains throughout the county. It is wet most of the time because the water table is high. Drainage can be improved readily if suitable outlets are available.

Drained areas are suited to hay and pasture. Lime and fertilizer are needed. Undrained areas provide a limited amount of pasture late in summer. This soil provides good sites for dug ponds and is suitable for wildlife habitat.

Wetness limits the use of this soil for most nonfarm purposes. (Capability unit Vw–5)

Scarboro Series, Silty Subsoil Variant

The Scarboro series, silty subsoil variant, consists of level or nearly level, very poorly drained soils that formed in sandy material underlain at a depth of about 18 to 24 inches by silt and very fine sand. These soils occur in low areas or depressions on outwash plains throughout the county. Most of the acreage is wooded, principally with red maple.

A thin, dark reddish-brown, mucky layer is underlain by 6 to 12 inches of very dark gray fine sandy loam. Below this is a 10- to 20-inch layer of gray loamy sand. This material is underlain by gray or light-gray silt or very fine sand mottled with brownish yellow.

These soils commonly receive surface runoff from higher areas. Water moves very rapidly to moderately rapidly through the upper part of the profile and slowly or moderately slowly through the finer textured underlying ma-

terial. Drainage is difficult even if suitable outlets are available.

Scarboro fine sandy loam, silty subsoil variant, 0 to 3 percent slopes (SdA).—This soil is in low areas where the high water table and runoff or seepage from nearby slopes keep it wet most of the time.

This soil provides a limited amount of pasture late in summer. Drainage is difficult because of the slowly permeable underlying material and the lack of suitable outlets. Woodland is the most practical use for this soil. Some areas provide good sites for the construction of shallow ponds for waterfowl or other wetland wildlife.

Extreme wetness limits the use of this soil for many nonfarm purposes. (Capability unit Vw-5)

Scituate Series

The Scituate series consists of nearly level to gently sloping, moderately well drained soils that formed in compact glacial till derived mainly from granitic material. These soils occur on the lower part of ground moraines throughout much of the county. In their natural state, they are very stony or extremely stony. Many areas are wooded with mixed stands of hardwoods or white pine. Some areas have been cleared of stones and are used for cultivated crops.

In cultivated areas, the plow layer is very dark grayish-brown sandy loam. The upper part of the subsoil is yellowish-brown sandy loam, and the lower part is brownish-yellow sandy loam mottled with strong brown and dark yellowish brown. At a depth of about 1½ to 2½ feet is a fragipan of compact sandy loam or loamy sand. This material is brittle and is difficult to dig with a shovel. It breaks into clods that shatter.

Small fragments of granite and some fragments of gneiss or schist are scattered throughout the soil material. In some places the underlying fragipan is gravelly loamy coarse sand.

Because of the moderately slowly or slowly permeable fragipan, these soils are wet early in spring and after heavy rains. They often remain wet until late in spring and are occasionally wet in fall. Some areas also receive seepage from nearby slopes.

Scituate sandy loam, 0 to 3 percent slopes (SeA).—This soil occurs mainly in the central and western parts of the county. Most of the stones have been removed from the surface. The profile is like the one described for the series except that generally there are more mottles in the lower part of the subsoil. Included in some of the areas mapped are small areas of fine sandy loam.

This soil is suitable for silage corn, hay, or pasture. It needs to be drained and adequately limed and fertilized.

The use of this soil for many nonfarm purposes is limited by the fragipan. (Capability unit IIw-2)

Scituate sandy loam, 3 to 8 percent slopes (SeB).—This soil occupies small areas in the central and western parts of the county. In some places the surface layer is fine sandy loam. Most of the surface stones have been removed.

This soil is suitable for hay, pasture, and silage corn. Drainage is needed. Erosion is a hazard in cultivated areas. (Capibility unit IIw-2)

Scituate very stony sandy loam, 0 to 3 percent slopes (SfA).—This soil occurs as scattered small areas in the central and western parts of the county. It has a profile similar to that described for the series, except that in most places the surface layer is thinner and darker colored. In a few places the surface layer is fine sandy loam.

Stones on the surface are between 1 and 2 feet in diameter and are from 20 to 80 feet apart. They limit the use of this soil for tilled crops. It generally is not feasible to remove enough of the stones to make cultivation possible. The most practical use is for pasture or woodland.

The fragipan and seasonal wetness limit the use of this soil for many nonfarm purposes. (Capability unit Vs-22)

Scituate very stony sandy loam, 3 to 8 percent slopes (SfB).—This soil occurs mainly on ground moraines in the western part of the county. It has a profile like that described for the series except that the surface layer is thinner and darker colored. In some places the surface layer is fine sandy loam.

Stones on the surface generally are between 1 and 2 feet in diameter and are from 20 to 80 feet apart. They limit the use of this soil to pasture or woodland. If the stones are removed, this soil is suited to the same crops and can be managed in the same way as Scituate sandy loam, 3 to 8 percent slopes.

The fragipan and seasonal wetness limit the use of this soil for many nonfarm purposes. (Capability unit VIs-22)

Scituate extremely stony sandy loam, 0 to 3 percent slopes (SgA).—This soil occurs as small areas in the northern and western parts of the county. It has a profile like that described for the series except that the surface layer is thinner and darker colored. Included in the areas mapped are small wet spots. Stones on the surface are from 2 to 20 feet apart.

Surface stones limit the use of this soil to unimproved or native pasture, woodland, or wildlife habitat.

The fragipan, wetness, and extreme stoniness impose limitations for most nonfarm uses. (Capability unit VIIs-2)

Scituate extremely stony sandy loam, 3 to 8 percent slopes (SgB).—This soil has a profile like that described for the series except that the surface layer is thinner and darker colored and in a few places the depth to the fragipan is greater. Included in the areas mapped are a few areas of a more strongly sloping soil and some wet spots. Stones on the surface are from 2 to 20 feet apart.

Surface stones limit the use of this soil to unimproved native pasture, woodland, or wildlife habitat. Generally, it is impractical to remove enough of the stones to make cultivation possible.

The fragipan, seasonal wetness, and stoniness impose limitations for most nonfarm uses. (Capability unit VIIs-2)

Tidal Marsh

Tidal marsh (Td) consists of very poorly drained organic and mineral deposits that are flooded regularly by tidal action. It occupies low-lying tracts along bays and streams. The mineral deposits are predominantly silt. The organic deposits are mainly accumulations of herbaceous vegetation.

Tidal marsh provides important habitat for waterfowl, some mammals, and many kinds of marine organisms. In the subsection "Use of Soils for Wildlife," under the heading "Wildlife Area 1," is a more detailed descrip-

tion of the different types of tidal marsh and their suitability for wildlife. (Capability unit VIIIw-1)

Tisbury Series

The Tisbury series consists of level to gently sloping, moderately well drained soils that formed in windblown very fine sand deposited as a mantle over coarse sand and gravel. These soils occupy only a small total acreage. They occur chiefly as pockets on the large outwash plain in the southeastern part of the county.

The surface layer is dark-brown very fine sandy loam about 8 inches thick. The subsoil is very fine sandy loam that is yellowish brown in the upper part and light yellowish brown in the lower part. The lower part is distinctly mottled with strong brown. The surface soil and subsoil are uniform in texture and contain few pebbles. At a depth of about 2½ feet, the subsoil is underlain abruptly by light yellowish-brown, loose coarse sand and gravel in which there are many particles of quartz and feldspar.

Tisbury soils are wet early in spring and after heavy rains. They often remain wet until late in spring and are occasionally wet in fall. Undrained areas are suitable for hay or pasture. Drained areas can be used for silage corn or other crops. Slopes are readily eroded if left bare during the winter. Wind erosion is a more serious hazard on these soils than on most other soils in the county. Seasonal wetness limits their use for most nonfarm purposes.

Tisbury very fine sandy loam, 0 to 8 percent slopes (TsA).—This soil occurs as small areas in the southeastern part of the county. It is underlain by coarse sand and gravel. Included in the areas mapped are small areas in which both the surface layer and subsoil are fine sandy loam.

This soil is easily tilled, and it retains moisture and plant nutrients well, but it is of limited use for crops because of wetness. It is susceptible to both wind and water erosion. (Capability unit IIw-5)

Walpole Series, Silty Subsoil Variant

The Walpole series, silty subsoil variant, consists of level or nearly level, poorly drained fine sandy loams that formed in sandy material underlain by silt and very fine sand. These soils occur in low-lying areas in the central part of the county.

An organic layer about 4 inches thick overlies a 4-inch mineral layer of very dark gray fine sandy loam. The upper part of the subsoil is a dark grayish-brown fine sandy loam, and the lower part is brown sandy loam. The subsoil is underlain at a depth of 12 to 20 inches by light olive-gray silt loam. This material is firm in place and breaks into clods if removed.

In a few places the subsoil consists of thin, alternating layers of silt and very fine sand.

These soils are saturated for 7 to 9 months each year. They receive surface runoff from nearby slopes, and water moves slowly downward through the dense, silty, underlying material.

Walpole fine sandy loam, silty subsoil variant, 0 to 3 percent slopes (WaA).—This soil occupies small areas along the Taunton River and its main tributaries. It is underlain by silt or firm very fine sand.

This soil is of limited use for crops because of wetness. Some areas can be drained enough to be suitable for some row crops. Ditches are needed both to drain this soil and to intercept runoff and seepage from nearby slopes. Land smoothing helps to eliminate low wet spots. Undrained areas can be used for summer pasture.

Wetness and the slowly permeable substratum limit the use of this soil for most nonfarm purposes. (Capability unit IIIw-5)

Wareham Series

The Wareham series consists of level to gently sloping, poorly drained soils that formed in thick deposits of sand and gravel. These soils occupy low areas on outwash plains. Most areas are wooded, but some are used for pasture.

In wooded areas, a 3- or 4-inch organic layer overlies the mineral layer of black loamy sand. Below this is a thin layer of grayish-brown, leached loamy sand. The subsoil is light brownish-gray gravelly loamy sand prominently mottled with reddish brown. The substratum is pale-brown gravelly sand. Both the solum and the substratum are loose and single grained.

A seasonal high water table is at or near the surface for 7 to 9 months each year. There are no layers that prevent water from moving rapidly downward. Drainage can be improved if suitable outlets are available.

In Plymouth County, Wareham soils are mapped as undifferentiated units with Au Gres soils.

Warwick Series

The Warwick series consists of well-drained and somewhat excessively drained fine sandy loams underlain by deposits of stratified sand and gravel that contain many particles of dark-colored phyllite. These soils occupy outwash plains and terraces in the northeastern part of the county. Some areas are farmed, and others are wooded. In recent years many areas have been used for homesites.

In tilled areas, the plow layer is dark yellowish-brown fine sandy loam. This layer contains a few pebbles. The subsoil is dark yellowish-brown fine sandy loam in the upper part but becomes paler and sandier with depth. The substratum, which begins at a depth of about 25 inches, is stratified olive-brown sand and gravel. It contains many particles of dark-colored phyllite.

In some places there are many outcrops of bedrock, and in a few areas there are cobblestones on the surface. The thickness of the sand and gravel varies considerably in areas where bedrock outcrops. Water moves moderately rapidly to very rapidly through the surface layer and subsoil and very rapidly through the substratum.

Warwick soils can be worked early in spring and are well suited to truck crops.

Warwick fine sandy loam, 0 to 3 percent slopes (WbA).—This soil is underlain by stratified sand and gravel. It occupies outwash plains in the northeastern part of the county. Some areas are large.

This soil is suitable for early row crops, alfalfa, and clover hay. Erosion is only a slight hazard. Winter cover crops should follow row crops in the cropping system to help maintain the organic-matter content. Irrigation is needed. The underlying material is a good source of sand and gravel. (Capability unit I-5)

Warwick fine sandy loam, 3 to 8 percent slopes (WbB).—This soil occupies outwash plains and terraces in the northeastern part of the county. In some places cobblestones are scattered on the surface.

This soil is suitable for the crops commonly grown in the county, especially early row crops. It is easily tilled and can be worked early in spring.

There are few limitations for most nonfarm uses, unless large level tracts are needed. (Capability unit IIe–5)

Warwick fine sandy loam, 8 to 15 percent slopes (WbC).—This soil occupies the edges of outwash plains in the northeastern part of the county. It has a profile like that described for the series except that in some places the surface layer is thinner and the depth to sand and gravel is less. Slopes are short and irregular.

This soil is susceptible to erosion. As the short, irregular slopes are not suited to stripcropping or contour tillage, the use of this soil for row crops should be limited. Water moves very rapidly downward through the underlying substratum, and in some growing seasons there is not enough moisture for good plant growth.

The slope is a moderate limitation for most nonfarm uses. (Capability unit IIIe–5)

Warwick very rocky fine sandy loam, 3 to 15 percent slopes (WcC).—The surface of this soil is very irregular and rocky. There are many outcrops of bedrock. Deep deposits of sand and gravel lie close to the rock outcrops. Included in the areas mapped are a few areas where the slope is more than 15 percent.

Much of this soil is wooded. The use of this soil for cultivated crops is impractical, but fair pasture can be produced.

Outcrops of bedrock severely limit the use of this soil for most nonfarm purposes. Wooded areas provide many scenic homesites, but sites must be selected with care because bedrock is close to the surface in some places. (Capability unit VIs–7)

Windsor Series

The Windsor series consists of excessively drained loamy sands on outwash plains and on terraces that have low but steep escarpments. These soils formed in medium and fine sand. Most areas are wooded with white pine and scarlet oak. Some areas are cultivated.

In tilled areas, the plow layer is dark-brown loamy sand that is loose and crumbly. The upper part of the subsoil is loose, single-grain, strong-brown loamy sand. The lower part is light yellowish-brown loamy sand grading to pale-yellow sand. There are a few pebbles in the lower part of the subsoil. The substratum is loose, single-grain, light-gray and light olive-gray sand.

In some places, the substratum contains some granite or gneiss pebbles, but there are no gravel layers within 3½ feet of the surface.

Water moves very rapidly downward through the solum and substratum. Consequently, not enough moisture is retained for good plant growth. If left bare, Windsor soils are susceptible to both wind and water erosion.

Windsor loamy sand, 0 to 3 percent slopes (WnA).—This soil has the profile described as typical for the series. It is underlain by deep deposits of fine and medium sand. It is on outwash plains and terraces. Some tracts are large. A few wet spots are included in some of the areas mapped.

Early market garden crops can be grown if this soil is intensively managed. Irrigation is necessary even in normal growing seasons. (Capability unit IIIs–9)

Windsor loamy sand, 3 to 8 percent slopes (WnB).—This soil is on plains and terraces throughout much of the county. It has a profile similar to that described for the series except that the surface layer is somewhat thinner. It is underlain by deep deposits of fine and medium sand. Included in the areas mapped are a few small wet spots and some small areas that have stones on the surface.

This soil does not retain enough moisture for good plant growth. It can be used for row crops if it is irrigated and otherwise intensively managed. Winter cover crops should be grown, and large amounts of organic matter should be added. The limitations for most nonfarm uses are slight. (Capability unit IIIs–9)

Windsor loamy sand, 8 to 15 percent slopes (WnC).—This soil occurs on the sloping edge of outwash plains and terraces throughout much of the county. The surface layer is thinner than that described for the series, and most slopes are short. The underlying material consists of deep deposits of sand.

This soil does not retain enough moisture for good plant growth. It can be used for hay crops if it is carefully managed. Irrigation is needed. The limitations for most nonfarm uses are slight or moderate. (Capability unit IVs–9)

Windsor loamy sand, 15 to 35 percent slopes (WnE).—This soil occurs on escarpments along the edge of outwash terraces. The surface layer is thinner than that described for the series, and most slopes are short. The underlying material consists of deep deposits of sand.

This soil is suitable for woodland. Droughtiness and slope severely limit its use for crops, hay, or pasture, and for many nonfarm uses. (Capability unit VIIs–9)

Formation, Classification, and Morphology of Soils

This section discusses the factors of soil formation and their relation to the soils of the county, describes the major processes of soil formation, classifies the soils into higher categories, and discusses the morphology of the soils.

Factors of Soil Formation

Soil is formed by the interaction of parent material, climate, living organisms, time, and relief. The nature of the soil anywhere on the earth depends upon the combination of these five factors. The relative importance of each factor differs from place to place. In extreme cases, one factor may dominate in the formation of a soil and fix most of its properties.

The differences among the soils in Plymouth County can be attributed mainly to differences in parent material and relief. The other factors—climate, living organisms, and time—are fairly uniform throughout the county and do not account for important differences among the soils.

Parent material

Plymouth County lies wholly within the glaciated part of North America. Bedrock formations within and to the north of the county were the source of most of the glacial drift that constitutes the parent material of many of the soils in the county (*4, 5*). The depth, color, texture, porosity, and other soil characteristics are influenced by the kind of parent material. Most of the soils in the county formed in material derived from three kinds of rock: mixed rock, rock high in dark-gray phyllite, and rock high in quartz and feldspar.

Soils such as the Charlton and Merrimac formed in material derived from mixed rock. They contain igneous rock fragments of Quincy granite, Dedham granodiorite, and Salem gabbro-diorite. Braintree slate, Pondville conglomerate, and the Wamsutta formation are sources of red sandstone, shale, and slate material (*3*).

In the northeastern part of the county, the Bernardston Pittstown, Quonset, and Warwick soils formed in material derived from rock rich in dark-gray phyllite. Their color and, to a lesser extent, their texture were influenced by this dark-colored material.

The Carver soils in the eastern and southeastern parts of the county formed in material derived from rock rich in coarse crystalline feldspar, quartz, and a few dark-colored or readily weatherable minerals. As a result, these soils are coarse textured and they are low in nutrients and trace elements (*7*).

The topographic features of Plymouth County are largely the result of glacial advances and retreats during the Late Wisconsin stage of glaciation (*2*). The county is not far from the terminus of the ice advance. Thus, the landscape contains relatively more features associated with ice retreat than do areas to the north.

Glacial advances removed, mixed, and resorted the drift left from previous ice sheets. As the ice receded, a homogeneous mass of rock fragments, sand, silt, and some clay was deposited on much of the land surface. This material, known as glacial till, varies greatly in depth. In many places, the mantle of glacial till is thin and rests on unweathered rock that has entirely different characteristics.

The melting ice produced great rivers of water that carried sand and gravel from the glacier's edge and deposited these materials as stratified drift, or glaciofluvial material. These stratified deposits are the sandy and gravelly outwash plains and terraces that cover much of the county.

Wind activity, which occurred at and since the time of glacial recession, deposited sand and silt on the surface of the glacial drift in some areas.

As the ice melted, temporary ponds and lakes formed in low areas. Glacial streams flowing into these lakes formed sandy deltas in some places. Silt and very fine sand settled to the lake bottoms and formed varved glaciolacustrine deposits.

Thus, the mineral soils of Plymouth County formed in several kinds of glacial material—glacial till, glaciofluvial material, windblown deposits, and glaciolacustrine deposits. Soils that formed in glacial till generally are much less permeable than those that formed in glaciofluvial material. Soils that formed in glaciolacustrine deposits or windblown deposits are characterized by a narrow range in particle-size distribution.

Climate

The climate of Plymouth County is predominantly continental. Temperatures range widely from winter to summer and from day to night. Summers are moderately warm, and winters are moderately cold. Climatic differences, however, are not enough to cause major differences among the soils in the county. More detailed information on the climate is given in the section "Additional Facts About the County."

The effect of climate on soil formation depends largely on the temperature, the amount of rainfall, and the humidity, which in turn directly affect the plant cover. Physical weathering is most active in spring and fall, when there is alternate freezing and thawing. In Plymouth County, little clay has been produced by weathering. Consequently, the soils in Plymouth County have no horizons in which a significant amount of clay has accumulated. Rainfall is sufficient to induce chemical reactions and leaching, but the intensity of these activities is reduced during the winter months. Leaching has lowered the carbonate content, and thus the soils are predominantly acid. Oxidation and leaching, although active, are not so pronounced as in soils in warmer climates.

Living organisms

Plants, micro-organisms, earthworms, and other forms of life on or in the soil are active in the soil-forming processes.

Plant nutrients are brought from the lower layers to the surface layer, and organic matter is added to the soil through the action of plants and animals. Organic matter helps to increase the water-holding capacity of the soils and to limit the loss of plant nutrients through leaching.

Forest trees are the native vegetation of Plymouth County. Some nutrient elements, released through the weathering of mineral material, are picked up by tree roots, carried to the leaves, and then returned to the soil as the leaves decompose. Tree roots also penetrate compact layers and provide channels that water can enter.

In Plymouth County, pitch pine and scrub oak are dominant on the sandy soils, which are low in plant nutrients and low in water-holding capacity. Although plant nutrients are recycled in these soils, the total amount is smaller than that in soils more favorable for tree growth.

Hardwoods use larger amounts of calcium and other bases than coniferous trees, but these nutrients are returned to the soils as the leaves decompose. The soils in Plymouth County, however, were never high in bases and thus are acid even under a cover of hardwoods.

Peat soils formed in vegetation that accumulated under waterlogged conditions that restrict oxidation and decay. Muck soils and some tidal marshes formed under similar conditions.

By clearing and burning the forests and draining, cultivating, liming, and fertilizing the soils, man has changed the complex of living organisms that affect soil formation.

Time

The length of time that parent materials have lain in place, exposed to the action of climate and living organisms, determines in part the characteristics of the soil. In Plymouth County, many of the soils formed in parent material deposited during the Wisconsin glaciation. This material has been exposed to soil-forming processes for

less than ten thousand years, which is considered a short time for soils to form. The length of time, however, has been sufficient for distinctive soil horizons to develop.

A study of the time required for soil profile development is described in the section "Laboratory Data." This study indicates that a horizon sequence typical of an excessively drained sandy soil, such as the Carver, can develop in less than 4,500 years in Plymouth County.

Relief

The shape of the land surface, the slope, and the position of the water table have had great influence on the soils in the county. Throughout the county, climate and vegetation are fairly uniform and the soil material has been exposed to the soil-forming processes for about the same length of time. Thus, local differences in the soils are largely the result of differences in relief and in parent material.

In Plymouth County, the relief ranges from level or nearly level to steep. On gentle slopes, a large part of the precipitation enters the soil; on steep slopes, much of the precipitation runs off. As a result, deeper soil profiles develop on the gentle slopes, and shallower profiles on the steep slopes.

The effect of slope on soil drainage is most pronounced in soils that formed in slowly permeable parent material. Water entering such soils percolates very slowly through the underlying firm material. When the intake rate exceeds the slow percolation rate of the underlying material, water movement is controlled by the slope gradient. On steep slopes, the excess water is removed by subsurface seepage downslope, along the surface of the firm material. The drainage characteristics of these soils are partly determined by the rate of subsurface seepage. On more gentle slopes, water is removed more slowly, and the soils commonly have features associated with temporary wetness. In depressions, even at high elevations, water is removed so slowly that generally there is a perched water table. In these areas the soils have features associated with wetness.

Differences in elevation and depth to the water table largely determine drainage characteristics of soils formed in materials derived from glaciofluvial sand and gravel. Water percolates rapidly through the underlying loose coarse sand and gravel. The level of the water table does not fluctuate widely. Those soils having features associated with wetness occur in low areas where the water table is close to the surface.

Many soils in the county are nearly level and occur at low elevations or in depressions where surface runoff and internal drainage are slow or where the water table is high. These soils have a gray or mottled subsoil as a result of waterlogging and poor aeration.

Major Processes of Soil Formation

Horizonation in soils is the result of several processes. In Plymouth County, the most important of these processes are: (1) leaching of salts and carbonates, (2) accumulation of organic matter and sesquioxides, (3) downward movement of silica, (4) residual concentration of silica in the upper horizons, (5) reduction and transfer of iron and aluminum, (6) some destruction of silicate clay minerals, and (7) some movement of clay and silt size particles. In most soils, two or more of these processes are active. The differentiation of horizons in the soils of the county is due mainly to the accumulation of organic matter and to chemical changes involving iron and aluminum sesquioxides.

The soils formed in parent materials low in carbonates and in readily weatherable minerals. The small amounts of carbonates in the parent materials have been almost completely leached from the soils. Leaching is indicated by an acid reaction. Weathering and translocation of silicate clay minerals have not contributed significantly to horizon differentiation in the soils of this county.

Organic matter has accumulated in the surface layer of most of the soils. The amount accumulated is greatest in the poorly drained and very poorly drained soils.

Under well-aerated conditions, the rapid decomposition of organic matter results in an accumulation of an inch or two of organic material on the surface of a mineral soil. Such an accumulation is typical on the well drained, moderately well drained, and excessively drained soils in the county. Much of the precipitation percolates through this organic surface mat and carries humic acids into the soil. The humic acids attack the mineral particles, extract iron and aluminum from them, and form complex soluble sesquioxide-humate compounds. These compounds move downward in the soil until they are precipitated by chemical or microbial action as coatings on mineral particles.

The foregoing processes cause two distinctive horizons to develop. The "acid bath," which is most intense immediately below the organic mat, causes an eluvial, or leached, horizon to form. The pale, bleached color of this horizon is the result of the removal of iron and the absence of coatings on primary mineral particles. In most well-aerated soils in the county, the eluvial horizon is less than an inch thick, and in some soils, there is only a trace.

Iron and humus compounds accumulate as coatings on the mineral particles immediately below the eluvial horizon and form an illuvial horizon, or horizon of accumulation. The characteristic brownish and reddish hue of the illuvial horizon, or subsoil, is the result of coatings on primary mineral particles. Most of the accumulation is in the upper part of the illuvial horizon, where the hues are redder, the color values are lower, and the chromas are stronger. In Plymouth County, illuvial horizons are not considered to be fully developed, because they are relatively low in content of organic matter in comparison with those of soils formed in a similar but slightly cooler climate. In the poorly drained, sandy Au Gres soils, a thick eluvial horizon and an iron-rich illuvial horizon have formed as the result of the combined effects of a fluctuating water table and acid leaching.

In Plymouth County, many of the soils that formed in material derived from glacial till are underlain by a fragipan. The fragipan is low in organic-matter content, has high bulk density, is seemingly cemented and hard when dry, and is slowly permeable. The fragipan is considered to be a soil horizon, although its genesis is obscure. A leached horizon commonly occurs above the fragipan and within a zone that at times is affected by a perched water table or by laterally moving water.

Under partial aeration, the decomposition of organic matter nearly keeps pace with its accumulation. Consequently, poorly drained soils that are saturated for about 7 to 9 months during the year have a thin, dark-colored

surface layer. In mineral soils that are saturated almost continuously, decomposition of organic matter is so slow that a thick, dark-colored surface layer has formed.

The reduction and transfer of iron has occurred in all of the poorly drained and very poorly drained soils in the county and to some extent in the deeper horizons of the moderately well drained soils. The slow decomposition of organic matter forms water-soluble compounds that are moved downward by percolating water. These compounds cause the reduction and partial removal of iron in the mineral soil beneath the organic layer. This process, known as gleying, imparts a drab gray color to the mineral soil. The fluctuation of a ground water table, in the presence of potential reducing agents, results in the alternate oxidization and reduction of iron that give the soil a pattern of brownish-yellow mottles.

The extensive peat bogs and muck swamps in the county consist of organic material that accumulated in areas saturated with stagnant, low-oxygen water for very long periods of time. Under these conditions, organic matter tends to accumulate, and little decomposition takes place.

Classification of Soils

Soils are placed in narrow classes for the organization and application of knowledge about their behavior within farms, suburban developments, or counties. They are placed in broad classes for study and comparison of large areas, such as continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 and revised later (*12*, *13*). The system used in this soil survey was adopted for general use by the National Cooperative Soil Survey in 1965 (*15*). It is under continual study. Readers interested in the development of the system should refer to the literature available (*11*).

The current system of classification has six categories (*15*). Beginning with the most inclusive, the categories are the order, the suborder, the great group, the subgroup, the family, and the series. The categories are defined in terms of observable or measurable properties of the soils. Table 10 shows the classification of the soils of Plymouth County according to both the old system and the current system. The placement of some series in the current system, particularly in families, may change as more precise information becomes available.[6]

Under the current classification system, four orders are represented in Plymouth County—the Entisols, the Inceptisols, the Spodosols, and the Histosols. Following are brief descriptions of these four orders.

Entisols are essentially recent soils in which there has been little, if any, horizonation. They are only slightly modified from the geologic materials in which they formed. In Plymouth County, the principal modification has been the development of an ochric epipedon.

Inceptisols are soils that have started to develop characteristic properties in the various horizons. In Plymouth County, the Brockton and Birdsall are Inceptisols that have well-developed, very dark colored A1 horizons, or umbric epipedons.

[6] Au Gres soils are listed in table 10 as being in a sandy, mixed, mesic family. This classification is corrected for the soils correlated as Au Gres in this survey, but modal Au Gres soils are in a sandy, mixed, frigid family.

Spodosols are soils that somewhere in their profiles have distinct spodic horizons, which contain accumulations of iron and aluminum or organic colloids, or both. In Plymouth County, all of the well drained, moderately well drained, and excessively drained soils have spodic horizons caused by an accumulation of iron, aluminum, and organic colloid. The Au Gres series has a spodic horizon resulting chiefly from an accumulation of iron.

Histosols are soils that formed in accumulations of organic matter. At the present time, this order has not been subdivided into lower categories of classification. In Plymouth County, Muck and Peat represent this order.

Morphology of Soils

This subsection describes the morphology of the soils of each soil series in the county. It contains for each series (1) a statement concerning the dominant profile characteristics, (2) a description of a typical profile, (3) a discussion of the range in characteristics, and (4) a brief description of similar soils in the county and of other members of the drainage sequence.

Unless otherwise stated, the Munsell color notations are for moist soils.

Agawam Series

The Agawam series consists of deep, well-drained fine sandy loams that formed in thick sandy deposits.

Typical profile of an Agawam fine sandy loam (1 percent slope, idle field north of the Drew foundry, in Kingston):

Ap—0 to 10 inches, brown to dark-brown (10YR 4/3) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; very strongly acid; abrupt, smooth boundary.

B21—10 to 16 inches, strong-brown (7.5YR 5/8) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; very strongly acid; clear, wavy boundary. 6 to 8 inches thick.

B22—16 to 26 inches, yellowish-brown (10YR 5/6) sandy loam; weak, fine, granular structure; very friable; very strongly acid; clear, smooth boundary. 14 to 16 inches thick.

C—26 to 42 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; few scattered rounded pebbles in the lower part; few large roots; strongly acid.

The solum ranges from 24 to 32 inches in thickness. The uppermost 40 inches of the soil is free of coarse sand and gravel.

Typically, the color of the Ap horizon is dark brown (10YR 4/3, but the color ranges from 10YR to 7.5YR in hue and has a value and chroma of 3 or 4. In most places the surface layer is fine sandy loam, but in some places it is sandy loam.

In the B21 horizon, the color has a hue of 7.5YR or 10YR, a value of 4 or 5, and a chroma of 4 to 6. In the B22 horizon, the color is similar in hue to that of the B21 horizon, but it has a value of 5 or 6 and a chroma of 6 to 8. The upper part of the B horizon is fine sandy loam or sandy loam, and the lower part is sandy loam or loamy fine sand.

The C horizon ranges from pale brown (10YR 6/3) to pale yellow (2.5Y 7/4) in color. It is predominantly fine sand or sand.

Agawan soils are similar to soils of the Charlton, Merrimac, Warwick, Windsor, Deerfield, and Hinckley series, and to the silty subsoil variant of the Ninigret series. They differ from those soils mainly in that Charlton soils formed in glacial till and have coarse fragments, stones, and boulders throughout the profile; Merrimac and Warwick soils have a very gravelly substratum; Windsor soils are coarser textured; Deerfield soils are also coarser textured

TABLE 10.--CLASSIFICATION OF SOIL SERIES

Soil series	Current classification			1938 classification by great soil groups
	Family	Subgroup	Order	
Agawam	Coarse-loamy, mixed, mesic	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Agawam, silty subsoil variant.	Coarse-loamy, mixed, mesic	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Au Gres	Sandy, mixed, mesic	Entic Haplaquods	Spodosols	Ground-Water Podzols.
Belgrade	Coarse-silty, mixed, mesic	Aquentic Haplorthods	Spodosols	Brown Podzolic soils.
Bernardston	Coarse-loamy, mixed, mesic	Entic Fragiorthods	Spodosols	Brown Podzolic soils.
Birdsall	Coarse-silty, mixed, nonacid, mesic	Humic Haplaquepts	Inceptisols	Humic Gley soils.
Brockton	Sandy, mixed, mesic	Humic Fragiaquepts	Inceptisols	Humic Gley soils.
Carver	Sandy, mixed, mesic	Entic Haplorthods 1/	Spodosols	Brown Podzolic soils intergrading to Regosols.
Charlton	Coarse-loamy, mixed, mesic	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Deerfield	Sandy, mixed, mesic	Aquentic Haplorthods	Spodosols	Brown Podzolic soils.
Enfield	Coarse-silty over sandy or sandy-skeletal, mixed, mesic.	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Essex	Coarse-loamy, mixed, mesic	Entic Fragiorthods	Spodosols	Brown Podzolic soils.
Gloucester	Sandy, mixed, mesic	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Hinckley	Sandy-skeletal, mixed, mesic	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Hollis	Loamy, mixed, mesic	Entic Lithic Haplorthods	Spodosols	Brown Podzolic soils.
Merrimac	Sandy, mixed, mesic	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Muck	(Not classified)	(Not classified)	Histosols	Bog soils.
Ninigret, silty subsoil variant.	Coarse-loamy, mixed, mesic	Aquentic Haplorthods	Spodosols	Brown Podzolic soils.
Norwell	Sandy, mixed, mesic	Typic Fragiaquepts	Inceptisols	Low-Humic Gley soils.
Peat	(Not classified)	(Not classified)	Histosols	Bog soils.
Pittstown	Coarse-loamy, mixed, mesic	Aquentic Fragiorthods	Spodosols	Brown Podzolic soils.
Quonset	Sandy-skeletal, mixed, mesic	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Raynham	Coarse-silty, mixed, nonacid, mesic	Typic Haplaquepts	Inceptisols	Low-Humic Gley soils.
Saco	Coarse-loamy, mixed, nonacid, mesic 2/.	Fluventic Haplaquepts	Inceptisols	Humic Gley soils.
Scarboro	Mixed, mesic	Mollic Psammaquents	Entisols	Humic Gley soils.
Scarboro, silty subsoil variant.	Sandy over loamy, mixed, mesic	Mollic Psammaquents	Entisols	Humic Gley soils.
Scituate	Coarse-loamy, mixed, mesic	Aquentic Fragiorthods	Spodosols	Brown Podzolic soils.
Tisbury	Coarse-silty over sandy or sandy-skeletal, mixed, mesic.	Aquentic Haplorthods	Spodosols	Brown Podzolic soils.
Walpole, silty subsoil variant.	Coarse-loamy, mixed, acid, mesic	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils.
Wareham	Mixed, mesic	Typic Psammaquents	Entisols	Low-Humic Gley soils.
Warwick	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic.	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Windsor	Sandy, mixed, mesic	Entic Haplorthods	Spodosols	Brown Podzolic soils.

1/ These soils have weakly developed spodic horizons and could possibly be classified as Typic Udipsamments.

2/ In Plymouth County, Saco soils are more acid than the typical Saco soils in other places.

and are mottled in the lower part of the B horizon; Hinckley soils have gravel in the solum and have a very gravelly substratum; and Ninigret soils are mottled in the lower part of the B horizon.

Agawam Series, Silty Subsoil Variant

The Agawam series, silty subsoil variant, consists of well-drained soils that formed in sands over silt.

Typical profile of an Agawam fine sandy loam, silty subsoil variant (2 percent slope, wooded area southeast of intersection of Wolf Island Road and the Bristol County line, in Rochester):

O2—1 inch to 0, black (10YR 2/1) organic matter.

A1—0 to 4 inches, very dark brown (10YR 2/2) fine sandy loam; weak, fine, granular structure; very friable; many, fine, fibrous roots; extremely acid; abrupt, smooth boundary.

A2—4 to 6 inches, light-gray (2.5Y 7/2) loamy fine sand; single grain; loose; common fine roots; very strongly acid; abrupt, smooth boundary.

B21—6 to 9 inches, strong-brown (7.5YR 5/6) fine sandy loam; weak, fine, granular structure; very friable; common fine roots; very strongly acid; abrupt, smooth boundary.

B22—9 to 13 inches, strong-brown (7.5YR 5/8) fine sandy loam; weak, fine, granular structure; very friable; common roots; very strongly acid; abrupt, smooth boundary.

B23—13 to 24 inches, reddish-yellow (7.5YR 6/6) sandy loam; single grain; loose; common roots; very strongly acid; clear, smooth boundary.

C1—24 to 30 inches, pale-yellow (2.5Y 7/4) sand; single grain; loose; strongly acid; abrupt boundary.

IIC2—30 to 50 inches +, light brownish-gray (2.5Y 6/2) silt and very fine sand with many, coarse, prominent, red (2.5YR 4/6) mottles in the fine sand fraction; massive; firm; strongly acid.

The solum ranges from 20 to 30 inches in thickness. The depth to the IIC horizon ranges from 30 to 40 inches. Except for the Ap horizon in limed fields, these soils range from strongly acid to extremely acid. They have weak structure or are structureless.

The A1 horizon ranges from black (N 2/0) to dusky red (2.5YR 3/2) in color, and the A2 horizon from light gray (5Y 7/1) to gray (10YR 5/1). In cultivated areas the Ap horizon is 6 to 10 inches thick and has a hue of 10YR and a value and chroma of 3 or 4. Typically, the surface layer is fine sandy loam, but it ranges to sandy loam. Commonly, the A horizon has weak, fine, granular structure.

In the B21 and B22 horizons, the color ranges from 7.5YR to 10YR in hue, from 4 to 6 in value, and from 6 to 8 in chroma. The texture is commonly fine sandy loam but ranges to sandy loam. Structure commonly is weak, fine, granular in the upper part of the B horizon and single grain in the lower part. In the B23 horizon, the color has the same hue and chroma as that of the B21 and B22 horizons but is one unit higher in value. The texture is sand, loamy sand, or sandy loam.

In the IIC2 horizon, the color has a hue of 2.5Y or 5Y, a value of 5 to 7, and a chroma of 2 or 3. The texture ranges from silt to very fine sand. In places this horizon contains varves of silt and very fine sand. In the C horizon, the soil is firm in place and friable if removed.

Agawam soils, silty subsoil variant, are similar to Agawam and Merrimac soils in color and texture but are underlain by silt, whereas Agawam and Merrimac soils are underlain by sand or by sand and gravel. They differ from Ninigret soils, silty subsoil variant, in that Ninigret soils are mottled in the lower part of the B horizon.

Agawam soils, silty subsoil variant, are the well drained members of the drainage sequence that includes the moderately well drained Ninigret soils, silty subsoil variant; the poorly drained Walpole soils, silty subsoil variant; and the very poorly drained Scarboro soils, silty subsoil variant.

Au Gres Series

The Au Gres series consists of poorly drained soils that formed in thick sandy deposits. These soils are wet during part of the year.

Typical profile of an Au Gres loamy sand (2 percent slope, wooded area along Center Street, 2.4 miles south of Wenham Street, in Carver):

O1—2 inches to 0, partially decomposed pine needles.

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) loamy sand; single grain; loose; many roots; extremely acid; abrupt, smooth boundary.

A21—4 to 19 inches, light brownish-gray (10YR 6/2) sand; single grain; loose; few roots; very strongly acid; smooth boundary. 14 to 16 inches thick.

A22—19 to 21 inches, reddish-gray (5YR 5/2) coarse sand; single grain; loose; few roots; strongly acid; abrupt, smooth boundary.

B2—21 to 40 inches, mixed dark reddish-brown (5YR 2/2 and 3/4) and some black (5YR 2/1) coarse sand with few, fine, distinct, strong-brown (7.5YR 5/8) mottles; single grain; loose; no roots; strongly acid; abrupt, smooth boundary.

C—40 to 48 inches +, light brownish-gray (10YR 6/2) sand with few, fine, faint, yellowish-brown (10YR 4/6) mottles; single grain; loose; strongly acid.

The solum ranges from 30 to 40 inches in thickness. The upper part is extremely acid or very strongly acid, and the lower part is strongly acid or very strongly acid. In places pebbles are scattered throughout the soil material.

The A1 horizon is typically very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3), but the color ranges from 10YR to 5YR in hue and has a value and chroma of 2 or 3. The texture of the surface layer ranges from sandy loam to sand but in most places is loamy sand.

In the B horizon, the color ranges from 5YR to 10YR in hue and from 2 to 5 in value. Generally, the chroma is 2. The texture ranges from loamy sand to sand. In places there are thin, weakly cemented layers or lenses in the B2 horizon.

In the C horizon, the color ranges from 10YR to 5Y in hue and from 5 to 7 in value. The chroma is 2 or 3. The texture is typically sand. Mottles in the C horizon range from 7.5YR to 2.5Y in hue, have a value of 4 or 5, and have a chroma of 2 to 8.

Au Gres soils differ from the poorly drained Wareham soils and the very poorly drained Scarboro soils in that they have a dark reddish-brown B horizon high in content of iron.

Au Gres soils occupy depressions and drainageways on glaciofluvial plains and are associated with the poorly drained Wareham soils. They are at slightly higher elevations than the very poorly drained Scarboro soils and are at lower elevations than the moderately well drained Deerfield soils, the well drained Agawam soils, the somewhat excessively drained Merrimac soils, and the excessively drained Hinckley, Carver, and Windsor soils.

Belgrade Series

The Belgrade series consists of moderately well drained soils that formed in lacustrine silt and very fine sand.

Typical profile of a Belgrade silt loam (5 percent slope, in a formerly cultivated area, 500 feet east of Pond Street, on the south side of the Matfield River, in Bridgewater):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

B21—6 to 15 inches, light yellowish-brown (10YR 6/4) silt loam; massive, breaks to small clods if removed; friable; common roots; very strongly acid; abrupt, smooth boundary.

B22—15 to 25 inches, light-gray (10YR 7/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; massive, breaks to small clods if removed; friable; few roots; very strongly acid; abrupt, wavy boundary.

Cg—25 to 42 inches +, dark-gray (N 4/0) silt loam; weakly varved; firm; no roots; very strongly acid.

In most places the surface layer is silt loam, but in some places it is loam or very fine sandy loam. The texture throughout the profile corresponds closely to that of the surface layer. There is little variation in texture. In the Ap and B horizons, the soil material is friable or very friable when moist and slightly sticky but nonplastic when wet.

The Ap horizon in cultivated areas is typically dark grayish brown (10YR 4/2), but the color ranges from 10YR to 7.5YR in hue and has a value of 3 or 4 and a chroma of 2 or 3.

The color of the B21 horizon ranges from 10YR to 2.5Y in hue and has a value of 4, 5, or 6 and a chroma of 4. The color of the B22 horizon is similar in hue to that of the B21 horizon, but the value is 5, 6, or 7, and the chroma is 2 or 3.

The color of the Cg horizon ranges from dark gray (N 4/0) to olive gray (5Y 4/2).

The mottles range from strong brown (7.5YR 5/6) to dark reddish brown and are distinct or prominent.

Belgrade soils differ from Tisbury and Deerfield soils and from Ninigret soils, silty subsoil variant, in that Tisbury soils have a sandy and gravelly substratum and Deerfield and Ninigret soils have a coarser textured solum.

Belgrade soils are the moderately well drained members of a drainage sequence that includes the poorly drained Raynham and the very poorly drained Birdsall soils.

Bernardston Series

The Bernardston series consists of well-drained silt loams that formed in compact till derived from dark-colored phyllite.

Typical profile of a Bernardston silt loam (12 percent slope, idle field of grass off Route 3A and 200 yards southeast of junction with Route 128, in Hingham):

Ap—0 to 10 inches, brown to dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; very friable; many fine roots; 10 to 15 percent coarse fragments of dark-gray phyllite, less than 3 inches in diameter; very strongly acid; abrupt, smooth boundary. 9 to 10 inches thick.

B21—10 to 17 inches, yellowish-brown (10YR 5/6) silt loam; weak, medium, granular structure; very friable; common, fine, fibrous roots; 10 to 15 percent coarse fragments of dark-gray phyllite and scattered fragments of granite and gneiss, up to 6 inches in diameter; very strongly acid; clear, smooth boundary. 6 to 12 inches thick.

B22—17 to 22 inches, light olive-brown (2.5Y 5/6) silt loam; weak, fine, granular structure; very friable; 15 to 20 percent coarse, angular fragments of phyllite; very strongly acid; abrupt, wavy boundary. 5 to 10 inches thick.

Cx—22 to 36 inches +, olive (5Y 5/3) silt loam; moderate, medium, platy structure; firm; 10 to 15 percent coarse, angular fragments of phyllite; strongly acid.

There is little variation in texture throughout the profile. The solum has weak to moderate, granular structure but tends to break into clods. The Cx horizon has weak to strong, platy structure. In places there are faint to distinct mottles in the upper part of the Cx horizon. The solum ranges from 20 to 30 inches in thickness. Coarse fragments make up 10 to 20 percent of the volume of the solum and substratum. The fragments are mostly thin, flat pieces of phyllite, less than 6 inches long. The Bernardston soils are very stony in their natural state, but in most places they have been cleared of surface stones to permit tillage.

In the Ap horizon, the color ranges from 7.5YR to 10YR in hue, has a value of 3 or 4, and has a chroma of 2 or 3.

In the B21 horizon, the hue is 10YR, the value is 4 or 5, and the chroma is 4 or 6. In the B22 horizon, the hue is 2.5Y, the value is 5, and the chroma is 4 to 6.

In the Cx horizon, the hue is 5Y, the value is 5, and the chroma is 2 or 3.

Bernardston soils are similar to Essex and Pittstown soils. They differ from those soils mainly in that Essex soils are coarser textured, are yellowish brown in the lower part of the B horizon, and have a brittle rather than a firm fragipan. Pittstown soils are moderately well drained and are mottled in the lower part of the B horizon.

Bernardston soils are the well drained members of a drainage sequence that includes the moderately well drained Pittstown soils.

Birdsall Series

The Birdsall series consists of very poorly drained soils that formed in deposits of very fine sand and silt. These soils are wet much of the year.

Typical profile of a Birdsall silt loam (1 percent slope, wooded area 700 feet west of Walnut Street and 1,200 feet northwest of intersection with Thompson Street, in Halifax):

O1—3 to 2 inches, partially decomposed leaf litter.

O2—2 inches to 0, very dark brown (10YR 2/2) decomposed organic matter.

A1—0 to 7 inches, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; very friable; many, fine, fibrous roots; very strongly acid; abrupt, wavy boundary. 7 to 10 inches thick.

C1—7 to 9 inches, light brownish-gray (2.5Y 6/2) silt loam; massive; friable; few roots; strongly acid; abrupt, irregular boundary. 2 to 4 inches thick.

C2g—9 to 40 inches +, gray (N 5/0) lenses or varves of silt and very fine sand; common, coarse, prominent mottles of strong brown (7.5YR 5/8); massive to weak, platy structure; firm; medium acid.

The texture commonly is silt loam throughout the solum. The upper part of the solum either has weak, fine, granular structure or is structureless. In places the C horizon contains thin lenses of very fine sand, less than 2 millimeters thick, interbedded with thin lenses of silt.

In color, the A1 horizon is predominantly very dark gray (10YR 3/1), but in a few places it is very dark gray (N 3/0) or black (N 2/0).

The color of the C1 horizon ranges from 10YR to 2.5Y in hue. The value is 5 to 6, and the chroma is 2. Typically, the C2g horizon is gray (N 5/0), but the color ranges to 5Y in hue and has a value of 6 or 7 and a chroma of 2.

Mottling ranges from a few, fine to coarse, faint mottles with a hue of 2.5Y or 5Y to common coarse mottles with a hue of 7.5YR.

Birdsall soils resemble Saco soils, but they are slightly finer textured and are more uniform in texture throughout the profile.

Birdsall soils are the very poorly drained members of a drainage sequence that includes the poorly drained Raynham and the moderately well drained Belgrade soils.

Brockton Series

The Brockton series consists of very poorly drained soils that formed in sandy and stony glacial till derived mainly from granite and gneiss.

Typical profile of a Brockton loam (forested area off Route 123, on Kings Landing Lane, about 1 mile east of Norwell):

O1—2 inches to 0, freshly fallen leaf litter.

A1—0 to 11 inches, black (10YR 2/1) loam with common medium, prominent, red (2.5YR 5/6) mottles; moder-

ate, medium, granular structure; very friable; many roots; 10 percent gravel and some stones; extremely acid; abrupt, wavy boundary. 10 to 14 inches thick.

C1g—11 to 17 inches, gray to light-gray (5Y 6/1) gravelly loamy sand with common (15 percent), medium, prominent, strong-brown (7.5YR 5/8) mottles; massive; friable to firm; common roots; 25 to 35 percent gravel, cobblestones, and some stones; very strongly acid; clear, irregular boundary. 4 to 12 inches thick.

C2xg—17 to 42 inches +, gray to light-gray (5Y 6/1) loamy sand with many (30 percent), medium and coarse, prominent mottles of yellowish brown (10YR 5/6 and 5/8); massive; very firm; no roots; 15 to 20 percent coarse fragments and a few stones; tongues, ½ inch to 1½ inches wide, of material from C1g horizon extend into this horizon to form coarse polygons, 10 to 16 inches wide; very strongly acid.

The depth to the fragipan ranges from 12 to 24 inches. The content of gravel, cobblestones, and stones ranges from about 10 percent to 35 percent, by volume. The reaction throughout the profile ranges from extremely acid to medium acid but is generally very strongly acid or strongly acid.

The A1 horizon is typically black (10YR 2/1) but ranges to very dark brown (10YR 2/2). In most places it is loam, but it ranges to sandy loam. In some places there is from 4 to 12 inches of muck on the surface. The A1 horizon commonly has moderate, medium, granular structure.

The C1g horizon commonly is gray (N 6/0) or light gray (N 7/0), but the color ranges from 4 to 6 in value and has a chroma of 1. The C1g horizon ranges from loamy sand to gravelly loamy sand and contains a few, fine, faint mottles to common, medium, prominent mottles.

In the C2xg horizon, the color has a hue of 10YR, 2.5Y, or 5Y, ranges from 4 to 7 in value, and has a chroma of 0 or 1. Faint to prominent, contrasting mottles occur in this horizon. The upper part of the C2xg horizon ranges from loamy coarse sand to loamy sand. In places sandy loam occurs below a depth of 30 inches. The C2xg horizon is single grain and massive.

Brockton soils are darker colored, wetter, and less mottled than Norwell soils. They are coarser textured than Birdsall and Saco soils, and they have a fragipan, which those soils lack. In texture they are similar to Scarboro soils, but they differ from Scarboro soils in that they are stony and have a fragipan.

Brockton soils are the very poorly drained members of a drainage sequence that includes the poorly drained Norwell soils, the moderately well drained Scituate soils, and the well drained Essex soils. They are closely associated with the somewhat excessively drained Gloucester soils.

Carver Series

The Carver series consists of deep, excessively drained, coarse-textured soils.

Typical profile of a Carver coarse sand (1 percent slope, wooded area 100 feet east of Tihonet Road and 1 mile north of junction with Route 28, in Wareham):

O1—2 inches to 1 inch, partially decayed litter of pitch pine and scrub oak.

O2—1 inch to 0, very dark brown (10YR 2/2) organic matter.

A1—0 to 5 inches, black (N 2/0) coarse sand; very weak, medium, granular structure; very friable to loose; common fine and coarse roots; 1 percent gravel; extremely acid; abrupt, wavy boundary. 4 to 6 inches thick.

A2—5 to 7 inches, gray (10YR 5/1) coarse sand; single grain; loose; common, fine, fibrous roots; 1 percent gravel; extremely acid; abrupt, wavy boundary. 2 to 3 inches thick.

B21—7 to 12 inches, strong-brown (7.5YR 5/6) coarse sand; single grain; loose; common, fine, fibrous roots; 1 percent gravel; very strongly acid; clear, smooth boundary. 5 to 7 inches thick.

B22—12 to 17 inches, yellowish-brown (10YR 5/6) coarse sand; single grain; loose; common fine and coarse roots; 2 percent gravel; very strongly acid; clear, smooth boundary. 4 to 5 inches thick.

B23—17 to 22 inches, yellowish-brown (10YR 5/6) coarse sand; single grain; loose; common fine and coarse roots; 2 percent gravel, ½ to 1 inch in diameter; very strongly acid; clear, smooth boundary. 4 to 6 inches thick.

B24—22 to 25 inches, yellowish-brown (10YR 5/6) coarse sand; single grain; loose; 3 to 4 percent gravel; few fine roots; very strongly acid; clear, smooth boundary. 3 to 4 inches thick.

B3—25 to 29 inches, brownish-yellow (10YR 6/6) coarse sand; single grain; loose; 3 percent very fine gravel; few roots; very strongly acid; clear, smooth boundary. 3 to 4 inches thick.

C—29 to 50 inches, light yellowish-brown (2.5Y 6/4) coarse sand; single grain; loose; 3 percent very fine gravel; no roots; very strongly acid.

Typical profile of a Carver loamy coarse sand (nearly level idle area off Vaughn Street, in Middleboro):

Ap—0 to 8 inches, dark-brown (10YR 4/3) loamy coarse sand; very weak, fine, granular structure (appears to be induced by mycelia); very friable to loose; many, fine, fibrous roots; abrupt, smooth boundary.

B21—8 to 13 inches, strong-brown (7.5YR 5/6) loamy coarse sand and sandy loam; single grain; loose; clear, smooth boundary.

B22—13 to 24 inches, yellowish-brown (10YR 5/8) loamy coarse sand; single grain; loose; many roots; clear, smooth boundary.

B23—24 to 29 inches, yellowish-brown (10YR 5/6) loamy coarse sand; single grain; loose; few large roots; gradual boundary.

C—29 to 41 inches, light yellowish-brown (2.5Y 6/4) coarse sand; single grain; loose; few large roots.

In most places structure is lacking throughout the profile, but in some places the A1 horizon has weak, fine, granular structure that appears to be induced by mycelia threads. The solum ranges from 24 to 32 inches in thickness. Some scattered pebbles occur throughout the soil material.

The surface horizon is commonly coarse sand, but in places it is loamy coarse sand. Typically, the A2 horizon is gray (10YR 5/1) or dark gray (10YR 4/1), but the color ranges from 10YR to 5YR in hue, is from 3 to 6 in value, and is 1 or 2 in chroma. The darker colors are the result of soil material being mixed with charcoal dust left from the burning of the forest cover. Fragments of charcoal are also mixed with the soil material in the O2 and A1 horizons.

In the upper part of the B horizon, the color ranges from 7.5YR to 10YR in hue, has a value of 5, and ranges from 4 to 6 in chroma. The B horizon is coarse sand or loamy coarse sand.

In the C horizon, the color ranges from 7.5YR to 5Y in hue, has a value of 6 or 7, and ranges from 2 to 4 in chroma. The C horizon is typically coarse sand.

Carver soils resemble Deerfield, Hinckley, and Windsor soils, but Deerfield soils are lower in content of coarse sand and are mottled in the lower part of the B horizon; Hinckley soils have a gravelly solum and a very gravelly substratum; and Windsor soils have a more strongly developed B horizon and are higher in content of fine sand.

Charlton Series

The Charlton series consists of well-drained soils that formed in glacial till derived principally from mica schist, phyllite, and gneiss.

Typical profile of a Charlton fine sandy loam (4 percent slope, wooded area on Leavitt Street, in Hingham):

O1—1 to ½ inch, matted and partly decomposed leaves and twigs.

O2—½ inch to 0, dark reddish-brown (5YR 2/2) decayed litter.

A1—0 to 1 inch, black (10YR 2/1) fine sandy loam; weak, fine, granular structure; very friable; many roots; extremely acid; abrupt, smooth boundary.

B21—1 to 5 inches, dark-brown (7.5YR 3/2) fine sandy loam; weak, fine, granular structure; very friable; many roots; 5 percent coarse, subangular fragments; very strongly acid; abrupt, smooth boundary.

B22—5 to 13 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, granular structure; very friable; common roots; 5 percent coarse, subangular fragments; very strongly acid; abrupt, smooth boundary.

B23—13 to 20 inches, light yellowish-brown (10YR 6/4) fine sandy loam; weak, granular structure; very friable; 10 to 15 percent subangular fragments, chiefly granite and gneiss; common roots; very strongly acid; abrupt, smooth boundary.

B3—20 to 25 inches, light brownish-gray (2.5Y 6/2) sandy loam; single grain; loose; few fine roots; 10 to 20 percent coarse rock fragments; very strongly acid; abrupt, smooth boundary.

C—25 to 36 inches +, light olive-brown (2.5Y 5/6) gravelly sandy loam; very weak, granular structure or single grain; loose; no roots; 20 to 25 percent coarse fragments; very strongly acid.

The solum has weak, granular structure, and in places the substratum is structureless. The soil material is friable or very friable throughout the profile.

In the A1 horizon, the color has a hue of 10YR, a value of 2 or 3, and a chroma of 1 or 2. In the Ap horizon, the color has a hue of 10YR, a value of 3, and a chroma of 2 or 3. The A horizon is commonly fine sandy loam but ranges to very fine sandy loam.

In the upper part of the B horizon, the color has a hue of 10YR or 7.5YR, a value of 3 to 5, and a chroma of 2 to 6. In the lower part, the color has a hue of 2.5Y or 10YR, a value of 4 to 6, and a chroma of 2 to 8.

The C horizon ranges from gravelly sandy loam to fine sandy loam.

Charlton soils are similar to Bernardston, Enfield, Essex, Gloucester, Hollis, and Merrimac soils. They differ from those soils mainly in that Bernardston soils are finer textured and have a fragipan; Enfield soils have a medium-textured solum over a coarse-textured substratum; Essex soils are coarser textured and have a fragipan; Gloucester soils are similar in color but are coarser textured; Hollis soils are underlain by bedrock at a depth of about 1½ to 2 feet; and Merrimac soils have a very gravelly substratum.

Deerfield Series

The Deerfield series consists of moderately well drained soils that formed in thick deposits of sand. These soils are intermittently wet.

Typical profile of a Deerfield sandy loam (2 percent slope, on Auburn Street, 50 yards south of intersection with Curve Street, in Bridgewater):

Ap—0 to 10 inches, dark-brown (10YR 3/3) sandy loam; weak, fine, granular structure; very friable; many, fine, fibrous roots; slightly acid; abrupt, smooth boundary.

B21—10 to 20 inches, yellowish-brown (10YR 5/6) loamy sand; single grain; loose; few roots; less than 5 percent rounded gravel; medium acid; abrupt, smooth boundary.

B22—20 to 28 inches, yellowish-brown (10YR 5/4) loamy sand with common, medium, prominent, yellowish-red (5YR 5/8) mottles; single grain; loose; no roots; less than 5 percent rounded gravel; medium acid; abrupt, smooth boundary.

C—28 to 42 inches +, grayish-brown (2.5Y 5/2) sand; single grain; loose; less than 5 percent rounded gravel; no roots; strongly acid.

The solum ranges from 20 to 30 inches in thickness. Faint to prominent mottles commonly occur at a depth of 16 to 18 inches, but the depth to mottling ranges from 14 to 20 inches. In places there are a few pebbles throughout the soil material.

The Ap horizon is typically dark brown (10YR 3/3). The surface horizon ranges from loamy sand to fine sandy loam in texture but in most places is sandy loam.

The B21 horizon is commonly yellowish brown (10YR 5/6), but the color ranges from 7.5YR to 2.5Y in hue and has a value of 4 or 5 and a chroma of 4 to 6. In texture, the B horizon is commonly loamy sand, but in places the lower part is sand.

In the C horizon, the color has a hue of 2.5Y to 5Y, a value of 4 or 5, and a chroma of 1 or 2. The texture is generally sand.

Deerfield soils are similar to Windsor soils in color and texture, but Windsor soils are free of mottles to a depth of 30 or 40 inches. Deerfield soils differ from Belgrade, Au Gres, and Wareham soils and from Ninigret soils, silty subsoil variant, in that Belgrade soils have a silt loam texture; Au Gres and Wareham soils are poorly drained and have distinctly different colors throughout the profile; and the silty subsoil variant of the Ninigret soils consists of sandy loam underlain by silt and very fine sand at a depth of less than 40 inches.

Deerfield soils are the moderately well drained members of a drainage sequence that includes the excessively drained Hinckley and Windsor soils, the somewhat excessively drained Merrimac soils, the poorly drained Au Gres and Wareham soils, and the very poorly drained Scarboro soils.

Enfield Series

The Enfield series consists of well-drained soils that formed in very fine sand over stratified sand and gravel.

Typical profile of an Enfield very fine sandy loam (1 percent slope, hayfield on White Horse Road, about 100 yards north of intersection with Warren Avenue, in Plymouth):

Ap—0 to 8 inches, dark-brown (10YR 3/3) very fine sandy loam; weak, fine, granular structure; very friable; many roots; strongly acid; smooth boundary.

B21—8 to 14 inches, dark yellowish-brown (10YR 4/4) very fine sandy loam; weak, fine, granular structure; very friable; many roots; strongy acid; clear, smooth boundary. 6 to 8 inches thick.

B22—14 to 24 inches, light olive-brown (2.5Y 5/4) very fine sandy loam; massive; very friable; common roots; strongly acid; clear, smooth boundary. 10 to 12 inches thick.

B23—24 to 30 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; massive; very friable; strongly acid; abrupt, wavy boundary.

IIC—30 to 44 inches +, pale-brown (10YR 6/3) gravelly coarse sand; loose; large amount of quartz particles and a few dark-colored minerals.

The solum ranges from 24 to 30 inches in thickness. Except for the Ap horizon in limed fields, the reaction ranges from strongly acid to very strongly acid.

The Ap horizon is typically dark brown (10YR 3/3) but ranges to very dark grayish brown (10YR 3/2). It is commonly very fine sandy loam but ranges to loam. It has weak, fine, granular structure or is single grain.

In the upper part of the B horizon, the color ranges from 7.5YR to 2.5Y in hue, has a value of 4 or 5, and ranges from 3 to 6 in chroma. In the lower part, the hue is 10YR or 2.5Y, the value is 5 or 6, and the chroma ranges from 4 to 8. The B horizon is typically very fine sandy loam. The upper part has weak, fine, granular structure, and the lower part is generally massive. The soil material is coherent in place but has a tendency to break into clods if removed.

The IIC horizon ranges from sand to gravelly sand. It is single grain and loose.

Enfield soils are similar to Belgrade, Merrimac, and Tisbury soils. They differ from those soils mainly in that Belgrade soils have a silt loam solum and are underlain by silt and very fine sand; Merrimac soils are coarser textured and have less pronounced textural change between the solum and substratum; and Tisbury soils are moder-

ately well drained and are mottled in the lower part of the B horizon.

Enfield soils are closely associated with the loose, coarse-textured Carver soils. They formed in an eolian mantle of very fine sand that was deposited over coarse sand, whereas the Carver soils formed in the coarse sand.

Essex Series

The Essex series consists of well-drained soils that formed in compact glacial till derived mainly from granite and gneiss.

Typical profile of an Essex coarse sandy loam (2 percent slope, hayfield, about 50 feet west of Laurel Street and ½ mile north of intersection with Auburn Street, in Bridgewater):

Ap—0 to 8 inches, dark-brown to brown (10YR 4/3) coarse sandy loam; weak, fine, granular structure; very friable; many fibrous roots; 15 to 20 percent granitic fragments ranging in size from gravel to cobblestones up to 10 inches in diameter; strongly acid; abrupt, smooth boundary.

B21—8 to 11 inches, strong-brown (7.5YR 5/6) gravelly coarse sandy loam; weak, fine, granular structure; very friable; many fibrous roots; 25 percent granitic fragments of gravel and cobblestones; strongly acid; abrupt, smooth boundary.

B22—11 to 15 inches, strong-brown (7.5YR 5/6) gravelly loamy coarse sand; single grain; loose; 20 percent subangular cobblestones; strongly acid; clear, smooth boundary.

B23—15 to 18 inches, reddish-yellow (7.5YR 6/6) gravelly loamy coarse sand; single grain; loose; 20 percent coarse fragments; strongly acid; clear, smooth boundary.

B24—18 to 24 inches, yellowish-brown (10YR 5/8) gravelly loamy coarse sand; single grain; loose; 35 percent coarse fragments; strongly acid; clear, smooth boundary.

A'2—24 to 30 inches, light brownish-gray (2.5Y 6/2) to light-gray (2.5Y 7/2) coarse sandy loam; massive; breaks to coarse clods if removed; very friable; 15 percent coarse fragments; very strongly acid; abrupt, smooth boundary.

Cx—30 to 36 inches +, light yellowish-brown (10YR 6/4) sandy loam; moderate, thick, platy structure; firm to very firm in place, friable if removed; 15 percent coarse fragments; very strongly acid.

These soils are very stony or extremely stony in their natural state, but in places they have been cleared of stones to facilitate tillage. The solum ranges from 24 to 30 inches in thickness.

The Ap horizon is typically dark brown (10YR 4/3), but the color ranges from 10YR to 7.5YR in hue, has a value of 3 or 4, and ranges from 2 to 4 in chroma. The surface horizon is commonly coarse sandy loam but ranges to very fine sandy loam.

In the upper part of the B horizon, the color ranges from 7.5YR to 10YR in hue, has a value of 4 or 5, and ranges from 6 to 8 in chroma. In the lower part, the color is similar in hue and chroma to that of the upper part, but the value is 5 or 6. The B horizon is gravelly coarse sandy loam or gravelly loamy coarse sand. The upper part of the B horizon either has weak, fine, granular structure or is single grain. The lower part is single grain or massive.

In the A'2 horizon, the color has a hue of 10YR or 2.5Y, a value of 5 to 7, and a chroma of 1 or 2. The texture is gravelly coarse sandy loam or gravelly loamy coarse sand. The A'2 horizon is single grain or massive.

In the Cx horizon, the color ranges from 10YR to 2.5Y in hue, has a value of 5 or 6, and ranges from 2 to 4 in chroma. The texture ranges from loamy coarse sand to gravelly coarse sandy loam. The Cx horizon either has weak to moderate, platy structure or is massive.

Essex soils are similar to Bernardston, Charlton, Gloucester, Hollis, Merrimac, and Scituate soils. They differ from those soils mainly in that Bernardston soils are finer textured, are darker colored, and have a better developed fragipan; Charlton soils do not have a fragipan within 2½ feet of the surface; Gloucester soils lack a fragipan; Hollis soils are shallower to bedrock; Merrimac soils have a very gravelly substratum; and Scituate soils are mottled in the lower part of the B horizon.

Essex soils are the well drained members of a drainage sequence that includes the moderately well drained Scituate soils, the poorly drained Norwell soils, and the very poorly drained Brockton soils.

Gloucester Series

The Gloucester series consists of somewhat excessively drained soils that formed in glacial till derived mainly from granite and gneiss.

Typical profile of a Gloucester very stony loamy sand (15 percent slope, wooded area about 50 feet east of Winter Street and 1,200 feet north of Cross Street, in Hingham):

A1—0 to ½ inch, dark-gray (10YR 4/1) very stony loamy sand; weak, fine, granular structure; very friable; many roots; 10 percent subangular fragments of rock; extremely acid; abrupt, smooth boundary. Stones on surface are generally from 20 to 80 feet apart.

B21—½ inch to 4 inches, dark yellowish-brown (10YR 4/4) loamy sand; very weak, fine, granular structure; very friable; many roots; 10 percent coarse fragments; very strongly acid; abrupt, wavy boundary. 3 to 5 inches thick.

B22—4 to 14 inches, strong-brown (7.5YR 5/6) gravelly loamy sand; very weak, fine, granular structure; very friable; many roots; 20 percent coarse fragments; very strongly acid; clear, smooth boundary. 9 to 11 inches thick.

B23—14 to 24 inches, brownish-yellow (10YR 6/6) gravelly loamy sand; single grain; loose; 20 percent coarse fragments; many roots; very strongly acid; clear, smooth boundary. 10 to 11 inches thick.

C—24 to 40 inches, light-gray (10YR 7/2) gravelly loamy sand; single grain; loose; 25 percent subangular fragments of rock; common roots; very strongly acid.

In their natural state these soils are very stony or extremely stony, but in a few places they have been cleared of surface stones to facilitate tillage. They either have weak, granular structure or are single grain in the upper part of the solum, and they are single grain in the lower part of the solum and in the substratum. The solum ranges from 18 to 26 inches in thickness. In some areas, a firm layer occurs below a depth of 30 inches.

In the A1 horizon the hue is commonly 10YR but in places is 7.5YR. The color ranges from 2 to 4 in value and has a chroma of 1 or 2. The surface horizon is dominantly loamy sand but ranges to fine sandy loam. In places there is an A2 horizon. In this horizon, the color has a hue of 10YR or 2.5Y, generally has a value of 6, and has a chroma of 1 or 2.

In the B21 horizon, the color has a hue of 10YR or 7.5YR, a value of 3 or 4, and a chroma of 3 or 4. In the lower part of the B horizon, the color is similar in hue to that of the B21 horizon, but the value is 5 or 6, and the chroma is 4 to 8. The upper part of the B horizon ranges from gravelly loamy coarse sand to coarse sandy loam. The lower part ranges from loamy sand to gravelly loamy coarse sand.

In the C horizon, the color has a hue of 10YR or 2.5Y, a value of 7, and a chroma of 1 to 4. The texture ranges from loamy sand to gravelly loamy coarse sand. In some areas the C horizon is loose and friable to a depth of 5 feet or more. In other areas it is firm at a depth of about 2½ to 5 feet.

Gloucester soils are similar to Carver, Charlton, Essex, Hinckley, and Windsor soils. Carver soils are sands and loamy coarse sands but contain only a few coarse fragments; Charlton soils are similar in color but are finer textured; Essex soils have a fragipan; Hinckley soils

formed in glaciofluvial sand and gravel and contain many subrounded fragments instead of subangular, coarse fragments; and Windsor soils formed in water-sorted sand and contain fewer coarse fragments.

Hinckley Series

The Hinckley series consists of excessively drained soils that formed in thick deposits of sand and gravel derived principally from granite and gneiss.

Typical profile of a Hinckley gravelly loamy sand (5 percent slope, in a formerly cultivated area south of Rockland Street, opposite intersection with Hanover Street, in Hanover):

Ap—0 to 7 inches, brown to dark-brown (10YR 4/3) gravelly loamy sand; single grain; loose; many roots; 25 percent granitic gravel and cobblestones; very strongly acid; abrupt, smooth boundary.

B21—7 to 13 inches, yellowish-brown (10YR 5/6) gravelly loamy sand; single grain; loose; few roots; 25 percent gravel and cobblestones; very strongly acid; clear, smooth boundary.

B22—13 to 19 inches, light yellowish-brown (10YR 6/4) gravelly loamy sand; single grain; loose; few roots; 25 percent coarse fragments; very strongly acid; gradual, smooth boundary.

IIC1—19 to 24 inches, very pale brown (10YR 7/4) very gravelly coarse sand; single grain; loose; no roots; 50 percent coarse fragments; very strongly acid; gradual, smooth boundary.

IIC2—24 to 40 inches +, light-gray (10YR 7/2) stratified coarse sand, gravel, and some cobblestones; single grain; loose; no roots; more than 50 percent coarse fragments; very strongly acid.

Some surface horizons have weak, granular structure, but generally all horizons are single grain. The substratum is typically stratified sand and gravel, although there are cobblestones in many places.

In the Ap horizon, the color has a hue of 10YR or 7.5YR, a value of 3 or 4, and a chroma of 3. The A1 horizon ranges from black (N 2/0) to very dark brown (10YR 2/2). The surface horizon is generally gravelly loamy sand. In places there is an A2 horizon. In this horizon, the color ranges from 5YR to 10YR in hue and from 4 to 6 in value. It has a chroma of 1 or 2.

In the B21 horizon, the color has a hue of 7.5YR or 10YR, a value of 4 or 5, and a chroma of 4 or 6. In hue, the B22 horizon is similar to the B21 horizon, but generally it has a value of 6 and a chroma of 4 to 8. The B horizon is commonly gravelly loamy sand, but the B21 horizon ranges to gravelly fine sandy loam.

In the C horizon, the color commonly has a hue of 10YR, a value of 6 or 7, and a chroma of 2 to 4. Structure is lacking.

Hinckley soils are similar to Quonset, Merrimac, Warwick, and Windsor soils. They differ from those soils mainly in that Quonset soils contain many fine fragments of dark-colored phyllite; Merrimac soils are finer textured and are less gravelly in the surface horizon and upper part of the B horizon; Warwick soils have a fine sandy loam solum and contain many fragments of phyllite; and Windsor soils are similar in texture to Hinckley soils but contain little gravel.

Hinckley soils are the excessively drained members of a drainage sequence that includes the moderately well drained Deerfield soils, the poorly drained Au Gres and Wareham soils, and the very poorly drained Scarboro soils.

Hollis Series

The Hollis series consists of somewhat excessively drained soils that are shallow to bedrock. These soils formed mainly in material derived from granite, gneiss, and phyllite.

Typical profile of a Hollis fine sandy loam (7 percent slope, wooded area on Pierce Avenue, about 100 yards northeast of School Street, in Lakeville):

O1—2 inches to 1 inch, slightly decomposed leaf litter.

O2—1 inch to 0, dark reddish-brown (5YR 2/2) organic matter.

A1—0 to 1 inch, dark yellowish-brown (10YR 3/4) fine sandy loam; weak, fine, granular structure; very friable; many roots; extremely acid; abrupt, smooth boundary.

B21—1 to 10 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, fine, granular structure; very friable; common roots; 15 percent flat and subangular coarse fragments; extremely acid; abrupt, smooth boundary.

B22—10 to 18 inches, yellowish-brown (10YR 5/4) gravelly fine sandy loam; weak, fine, granular structure; very friable; few roots; 20 percent coarse fragments; very strongly acid; abrupt, wavy boundary.

IIR—18 inches +, granite bedrock.

The thickness of the solum is controlled by the depth to bedrock, which ranges from 15 to 20 inches. Throughout the solum, structure is weak, fine, granular. The reaction is very strongly acid or extremely acid. In undisturbed areas, the surface is very stony or extremely stony. Outcrops of bedrock are from 10 to 300 feet apart.

In the A1 horizon, the color generally has a hue of 10YR, a value of 2 or 3, and a chroma of 2 to 4. In the Ap horizon, the hue is 10YR, the value is 3, and the chroma is 3 or 4. The surface horizon ranges from loam to fine sandy loam.

In the lower part of the B horizon, the hue is 10YR or 7.5YR, the value ranges from 3 to 5, and the chroma ranges from 4 to 6. The B horizon is predominantly fine sandy loam but ranges to loam.

Where a C horizon occurs, it is either fine sandy loam or loam.

Hollis soils are the only soils recognized in the county that formed in glacial till that is shallow to bedrock. They are similar to Charlton soils in color and texture. They differ from those soils mainly in that Charlton soils are well drained and are underlain by glacial till that in places forms a firm, slowly permeable layer at a depth of 3 to 5 feet.

Merrimac Series

The Merrimac series consists of somewhat excessively drained and well-drained soils that formed in thick deposits of sand and gravel derived mainly from granite and gneiss.

Typical profile of a Merrimac sandy loam (6 percent slope, wooded area on south side of Plymouth Street, about 50 yards east of the East Bridgewater town line in Halifax):

O2—1 inch to 0, organic matter in advanced stage of decomposition.

A1—0 to 1 inch, very dark gray (10YR 3/1) sandy loam; weak, fine, granular structure; very friable; many fine and coarse roots; extremely acid; abrupt, wavy boundary. 1 to 2 inches thick.

B21—1 to 12 inches, yellowish-brown (10YR 5/6) sandy loam that becomes paler with depth; weak, fine, granular structure; very friable; many roots; 5 percent gravel; very strongly acid; clear, smooth boundary. 10 to 12 inches thick.

B22—12 to 23 inches, yellowish-brown (10YR 5/8) sandy loam; weak, fine, granular structure; common roots; very friable; 5 percent gravel; very strongly acid; abrupt, wavy boundary. 9 to 12 inches thick.

IIB3—23 to 31 inches, light yellowish-brown (2.5Y 6/4) gravelly loamy sand; single grain; loose; 15 to 20 percent gravel and cobblestones, 3 to 6 inches in diameter; very strongly acid; abrupt, wavy boundary.

IIC—31 to 48 inches +, olive-brown (2.5Y 4/4) gravelly sand; single grain; loose; 40 percent subrounded granitic gravel and cobblestones, 3 to 6 inches in diameter; very strongly acid.

The solum ranges from 18 to 36 inches in thickness but in most places is about 30 inches thick. It is predominantly sandy loam and in some places is gravelly. It either has weak, fine, granular structure or is structureless.

In the A1 horizon, the color has a hue of 10YR to 5YR, a value of 2 or 3, and a chroma of 1 or 2. The texture is commonly sandy loam but ranges to fine sandy loam. In places there is an A2 horizon. In this horizon, the color is about the same in hue and chroma as that of the A1 horizon, but it has a value of 5 or 6. In the Ap horizon, the color has a hue of 10YR or 7.5YR, a value of 3, and a chroma of 3 or 4.

In the B21 horizon, the color ranges from 10YR to 7.5YR in hue, has a value of 4 or 5, and ranges from 4 to 6 in chroma. In the lower part of the B horizon, the color is similar in hue to that of the B21 horizon, but it has a value of 5 or 6 and a chroma of 4 to 8.

In the IIC horizon, the color ranges from 10YR to 2.5Y in hue and from 4 to 6 in value and has a chroma of 2 or 4. In most places the IIC horizon is stratified sand, gravel, and cobblestones. It is single grain.

Merrimac soils are similar to Agawam, Hinckley, and Warwick soils. Agawam soils are underlain by sand but are free of gravel. Hinckley soils are similar in profile sequence but are loamy sand or sand. Warwick soils contain many phyllite fragments.

Merrimac soils are closely associated with the moderately well drained Deerfield soils, the poorly drained Au Gres and Wareham soils, and the very poorly drained Scarboro soils.

Muck

Muck consists of very poorly drained soils that formed in an accumulation of plant material that has decomposed to the extent that plant remains cannot be readily identified.

Typical profile of Muck (wooded area about 1,200 feet southeast of Maple Street and north of powerline, in Scituate):

1—0 to 1 inch, dark reddish-brown (5YR 2/2) leaf litter, partly decomposed, chiefly from red maple and woody shrubs; matted in place but readily separated from underlying material; very strongly acid. 1 to 2 inches thick.

2—1 to 11 inches, dark reddish-brown (2.5YR 3/4), partially decomposed organic material stratified with black (N 2/0) disintegrated organic material; massive, breaks to 3- to 5-inch rectangular clods if removed; very friable; slightly sticky, slightly plastic; very strongly acid; abrupt, smooth, boundary.

3—11 to 20 inches, very dark brown (10YR 2/2), disintegrated organic matter; moderate, granular structure; very friable; slightly plastic, slightly sticky; very strongly acid; clear boundary. 9 to 12 inches thick.

4—20 to 30 inches, black (10YR 2/1), thoroughly decomposed organic matter; massive; slightly plastic, slightly sticky; very strongly acid; abrupt, smooth boundary.

IIC—30 to 36 inches +, light brownish-gray (10YR 6/2) fine and medium sand; single grain; loose; slightly mixed with organic matter in upper part; very strongly acid.

Muck soils range from 1 foot to many feet in thickness but are predominantly not more than 2½ feet thick. They are free of stones, but in some places boulders protrude above the surface in areas where the organic deposits are less than 2 feet thick over glacial till. These soils either have granular structure or are structureless. In color, they range from dark reddish brown (2.5YR 3/4) to black (N 2/0). The color has a value of 3 or less and a chroma of 4 or less. A value and a chroma of 2 are common.

Muck soils are similar to Peat soils, but Peat soils formed in organic material in which plant remains can be readily identified. Muck soils are also similar to the very poorly drained Brockton, Saco, and Scarboro soils, which have an organic surface layer less than 1 foot thick.

Ninigret Series, Silty Subsoil Variant

The Ninigret series, silty subsoil variant, consists of moderately well drained soils that formed in sandy material over silt. These soils are intermittently wet.

Typical profile of a Ninigret sandy loam, silty subsoil variant (2 percent slope, in a formerly cultivated area on School Street, 0.3 mile east of Titicut Street, in Middleboro):

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) sandy loam; weak, fine, granular structure; very friable; many roots; extremely acid; abrupt, smooth boundary.

B21—6 to 15 inches, strong-brown (7.5YR 5/8) sandy loam; very weak, granular structure; very friable; many roots; very strongly acid; abrupt, smooth boundary.

B22—15 to 28 inches, yellowish-brown (10YR 5/6) sandy loam; common, medium, faint, strong-brown (7.5YR 5/6) mottles; very weak, granular structure; very friable; common roots; very strongly acid; abrupt, smooth boundary.

IICg—28 to 40 inches +, gray to light-gray (5Y 6/1) silt loam with common, medium, prominent, strong-brown (7.5YR 5/6) and brown to dark-brown (7.5YR 4/4) mottles; massive; firm; exterior and interior of clods are the same color; very strongly acid.

The solum ranges from 24 to 33 inches in thickness. It has weak, granular structure and is loose or very friable. The mottles have a hue of 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. The reaction is very strongly acid or extremely acid.

In color, the Ap horizon is typically very dark grayish brown (10YR 3/2). The hue is generally 10YR, but the value is 2 or 3, and the chroma ranges from 2 to 4. The surface horizon commonly is sandy loam.

In the B horizon, the color ranges from 7.5YR to 2.5Y in hue, from 5 to 6 in value, and from 4 to 8 in chroma. The B horizon generally is sandy loam, but in places the lower part is loamy sand.

In the IIC horizon, the color typically has a hue of 5Y but ranges to 2.5Y in hue. The value is 5 or 6, and the chroma is 1 or 2. The IIC horizon is generally silt loam, but in a few places there are lenses of very fine sand. The IIC horizon is firm in place but friable if removed.

Ninigret soils, silty subsoil variant, are similar to the silty subsoil variant of Agawam soils and to Belgrade and Deerfield soils. Agawam soils are similar in color and texture throughout the solum but are free of mottles in the B horizon; Belgrade soils have a silt loam texture throughout the solum and the substratum; and Deerfield soils are similar in color throughout the profile, but their solum is sandier, and they are underlain by rapidly permeable loose sand instead of slowly permeable silt loam.

Ninigret soils, silty subsoil variant, are the moderately well drained members of a drainage sequence that includes the well drained Agawam soils, silty subsoil variant; the poorly drained Walpole soils, silty subsoil variant; and the very poorly drained Scarboro soils, silty subsoil variant.

Norwell Series

The Norwell series consists of poorly drained soils that formed in sandy and stony glacial till derived mainly from granite and gneiss.

Typical profile of a Norwell sandy loam (cultivated area, about 1½ miles east-northeast of East Bridgewater):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) sandy loam; weak, medium, granular structure; very friable; many fine roots; 15 percent gravel; very strongly acid; abrupt, smooth boundary. 7 to 10 inches thick.

C1—8 to 10 inches, grayish-brown (2.5Y 5/2) loamy coarse sand; few, medium, distinct, strong-brown (7.5YR 5/6) mottles; massive; soft subangular clods that crush to single grain; very friable; common roots;

15 to 20 percent gravel; very strongly acid; abrupt, smooth boundary. 0 to 6 inches thick.

C2—10 to 17 inches, dark grayish-brown (2.5Y 4/2) loamy sand; many, medium, prominent, reddish-brown (5YR 4/4) and yellowish-red (5YR 5/6) mottles; massive; soft subangular blocky clods that crush easily to single grain; very friable; common to few roots; 10 percent gravel and some stones; very strongly acid; abrupt, smooth boundary. 4 to 12 inches thick.

C3—17 to 20 inches, light-gray (2.5Y 7/2) loamy coarse sand; many, coarse, prominent, yellowish-red (5YR 5/8) mottles; massive but tends toward platiness; friable to firm; few roots; 10 to 15 percent gravel and some stones; very strongly acid; clear, wavy boundary. 0 to 6 inches thick.

C4x—20 to 32 inches, light-gray (2.5Y 7/2) loamy coarse sand; many, coarse, prominent, yellowish-red (5YR 4/6) mottles; massive or weak, thick, platy structure, organized in large polygons with light-gray (N 7/0) rind; very firm in place, friable if removed; crushes explosively under pressure; very few roots in the uppermost 3 inches, none below; 15 percent gravel and some stones; very strongly acid; clear, smooth boundary. 10 to 30 inches thick.

IIC5xg—32 to 48 inches +, gray to light-gray (5Y 6/1) sandy loam; many, fine and medium, prominent, yellowish-red (5YR 5/8) mottles; massive, but breaks into coarse, subangular blocks organized in large polygons with light-gray (N 7/0) rind; very firm in place, friable if removed; crushes explosively under pressure; no roots; 15 to 20 percent gravel and some stones; very strongly acid.

Profile of a Norwell sandy loam (2 percent slope, hayfield about 100 feet east of Walnut Street and 300 yards north of Central Street, in East Bridgewater):

Ap—0 to 7 inches, very dark gray (N 3/0) sandy loam; weak, medium, granular structure; very friable; fine roots; 15 percent subangular rock fragments; very strongly acid; abrupt, smooth boundary.

C1—7 to 14 inches, grayish-brown (2.5Y 5/2) loamy coarse sand; few, medium, distinct, strong-brown (7.5YR 5/6) mottles; massive, subangular blocky clods that crush easily to single grain; very friable; 15 to 20 percent subangular rock fragments; very strongly acid; abrupt, smooth boundary.

C2—14 to 16 inches, dark grayish-brown (2.5Y 4/2) loamy sand; common, medium, distinct, reddish-brown (5YR 4/4) mottles; massive; subangular blocky clods crush easily to single grain; very friable; 10 percent subangular rock fragments; very strongly acid; abrupt, smooth boundary.

C3—16 to 21 inches, light-gray (2.5Y 7/2) loamy coarse sand; many, coarse, prominent, yellowish-red (5YR 5/8) mottles; massive but tends towards platiness; friable to firm; 15 percent coarse fragments; very strongly acid; clear, smooth boundary.

C4x—21 to 35 inches, light-gray (2.5Y 7/2) loamy coarse sand; many, coarse, prominent, yellowish-red (5YR 4/6) mottles; massive or weak, thick, platy structure; crushes explosively under pressure; firm in place, friable if removed; 15 percent coarse fragments; very strongly acid; clear boundary.

IIC5xg—35 to 43 inches, gray (N 5/0) sandy loam; many, fine and medium, prominent, yellowish-red (5YR 4/8) mottles; massive; tends to break into weak, very coarse, subangular blocks if removed; firm in place, friable if removed; 10 percent coarse fragments; very strongly acid; gradual, smooth boundary.

IIC6xg—43 to 54 inches, gray (10YR 6/1) sandy loam; many, fine and medium, prominent, yellowish-red (5YR 4/8) mottles; massive; tends to break into weak, very coarse, subangular blocks; firm; 15 to 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

IIC7—54 to 67 inches, light olive-brown (2.5Y 5/4) gravelly sandy loam; many, coarse, distinct, strong-brown (7.5YR 5/6) mottles; massive; soft, subangular clods crush easily to single grain; friable; 20 percent coarse fragments; strongly acid; clear boundary.

IIC8—67 to 75 inches +, olive-brown (2.5Y 4/4) sandy loam; scattered thin lenses of clay; massive; soft, subangular clods crush easily to single grain; friable; 15 to 20 percent coarse fragments; strongly acid.

In places these soils are loose above the C3 and Cx horizons. The clods in the Cx horizon are brittle and shatter under pressure. Stones on the surface are between 1 and 2 feet in diameter and are from 2 to 20 feet apart.

The Ap horizon is typically very dark grayish brown (10YR 3/2) but ranges to very dark gray (N 3/0).

The C1 horizon ranges from dark gray (10YR 4/1) to grayish brown (2.5Y 5/2). In the C2 horizon, the color has a hue of 10YR or 2.5Y. Where the hue is 10YR, the value is 4 or 5 and the chroma is 2. Where the hue is 2.5Y, the value is 4 or 5 and the chroma is 2 or 3. The C1 and C2 horizons range from sand to loamy sand and are high in content of coarse and very coarse sand. In the C3 and Cx horizons, the color has a hue of 10YR or 2.5Y, a value of 6 or 7, and a chroma of 1 or 2. To a depth of about 30 inches, the Cx horizon ranges from sand to loamy coarse sand. Below this depth, it ranges from loamy coarse sand to sandy loam.

Norwell soils are similar to Brockton soils but differ from those soils mainly in that Brockton soils have a darker colored, thicker surface layer and are more strongly gleyed. They are also similar to Raynham soils, Wareham soils, and Walpole soils, silty subsoil variant, all of which are poorly drained, but they differ from those soils mainly in that Raynham soils have a silt loam texture throughout the profile; Wareham soils formed in deep deposits of sand and gravel and lack a fragipan; and Walpole soils, silty subsoil variant, formed in deposits of sand 12 to 20 inches thick over a slowly permeable silty substratum.

Norwell soils are the poorly drained members of a drainage sequence that includes the moderately well drained Scituate soils, the well drained Essex soils, and the very poorly drained Brockton soils.

Peat

Peat consists of very poorly drained soils that formed in an accumulation of plant material. This material is only partly decomposed and contains plant remains that can be readily identified. The deposits of Peat in the county formed mainly from three kinds of plants—reeds and sedges, which make up the largest deposits; woody vegetation, chiefly coastal white-cedar, which makes up the next largest deposits; and sphagnum moss.

Typical profile of Peat (wooded area about 1,000 feet south of Lake Street, on lane 1,200 feet northwest of Plympton town line, in Halifax):

1—0 to 1 inch, dark-brown fresh twigs and litter from white-cedar and woody shrubs.

2—1 to 30 inches, dark reddish-brown (5YR 3/3) woody and fibrous peat; friable; very strongly acid. 28 to 30 inches thick.

3—30 to 60 inches +, dark reddish-brown (5YR 3/3) woody peat with some fibrous material and partially decayed logs; very strongly acid.

Peat soils range from 1 foot to more than 30 feet in thickness over mineral material but in most places are from 8 to 10 feet thick. The color ranges from very dark brown (10YR 2/2) to dark reddish brown (2.5YR 3/4) but generally has a value and chroma of 3.

Peat is similar to Muck in that both are organic soils, but Muck formed in plant material decomposed to the extent that plant remains cannot be readily identified. Peat soils are also similar to Brockton, Scarboro, and Saco soils. In places Brockton soils have an organic surface

layer that is as much as 12 inches thick, but they are stony and have a fragipan. Scarboro and Saco soils have a dark-colored or mucky surface layer less than 12 inches thick.

Pittstown Series

The Pittstown series consists of moderately well drained soils that formed in compact till derived mainly from phyllite. These soils are intermittently wet.

Typical profile of a Pittstown silt loam (5 percent slope, pasture of the Riding Academy, north of Leavitt Street, in Hingham):

Ap—0 to 7 inches, brown to dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; very friable; many roots; 10 to 15 percent angular fragments of granite and channery fragments of phyllite, 1 to 4 inches in length; strongly acid; abrupt, smooth boundary.

B21—7 to 15 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, granular structure; very friable; common roots; 10 to 15 percent fragments of phyllite, 1 to 4 inches in length, and a few angular fragments of granite; very strongly acid; clear, smooth boundary.

B22—15 to 22 inches, olive (5Y 5/4) silt loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles and few, fine, faint, pale-olive (5Y 6/4) mottles; massive, but breaks into soft, subangular clods; few roots; 15 percent fragments of phyllite, ½ inch to 2 inches in length; very strongly acid; abrupt, smooth boundary.

Cx—22 to 30 inches +, olive (5Y 5/3) silt loam; common, medium, prominent, strong-brown (7.5YR 5/6) mottles; moderate, medium, platy structure; firm in place, friable if removed; 20 percent coarse fragments, principally phyllite, 1 to 4 inches in length, and a few angular fragments of granite, ¼ to 1 inch in diameter; very strongly acid.

In most places the surface layer is silt loam. Slightly less than half the acreage is very stony. Texture, color, structure, and consistence vary only slightly from those of the typical profile. The reaction is either strongly acid or very strongly acid, except in limed fields.

Pittstown soils are similar to Scituate soils in that both soils are moderately well drained, but Scituate soils are coarser textured and are brownish yellow instead of olive in the lower part of the B horizon.

Pittstown soils are the moderately well drained members of a drainage sequence that includes the well drained Bernardston soils, which are free of mottles in the lower part of the B horizon.

Quonset Series

The Quonset series consists of excessively drained soils that formed in thick deposits of sand and gravel derived principally from dark-colored phyllite.

Typical profile of a Quonset sandy loam (15 percent slope, wooded area on west side of Prospect Street, 750 yards north of Grove Street, in Norwell):

O1—2 inches to 1 inch, matted and partly decomposed organic matter.

O2—1 inch to 0, dark reddish-brown (5YR 3/2) organic matter in advanced stage of decomposition.

A1—0 to 1 inch, black (10YR 2/1) sandy loam; weak, fine, granular structure; very friable; many roots; extremely acid; abrupt, smooth boundary.

B21—1 to 3 inches, brown to dark-brown (10YR 4/3) sandy loam; weak, fine, granular structure; very friable; many roots; 5 percent gravel; extremely acid; abrupt, wavy boundary. 1 to 2 inches thick.

B22—3 to 9 inches, yellowish-brown (10YR 5/4) sandy loam; weak, fine, granular structure; very friable; common roots; 10 to 15 percent gravel; extremely acid; abrupt, wavy boundary. 6 to 8 inches thick.

IIB3—9 to 16 inches, yellowish-brown (10YR 5/6) gravelly loamy sand; single grain; loose; common roots; 35 to 45 percent gravel and cobblestones; very strongly acid; abrupt, smooth boundary.

IIIC—16 to 34 inches +, olive-brown (2.5Y 4/4) very gravelly sand; single grain; loose; a few roots in the upper part; 60 percent gravel and cobblestones.

The reaction is very strongly acid or extremely acid, except in limed fields.

The A1 horizon is typically black (10YR 2/1), but the color ranges from 10YR to 5YR in hue and has a value of 2 or 3 and a chroma of 1 or 2. In the Ap horizon, the color commonly has a hue of 10YR, a value of 3, and a chroma of 2 to 4. The surface horizon is commonly sandy loam.

In the B21 horizon, the color is generally brown to dark-brown (10YR 4/3) but ranges from 10YR to 2.5Y in hue, has a value of 3 or 4, and ranges from 3 to 6 in chroma. The texture is commonly sandy loam but ranges to gravelly loamy sand. In the B22 and IIB3 horizons, the color has the same hue as that of the B21 horizon, but the value is 5 and the chroma ranges from 4 to 6. The IIB horizon is commonly gravelly loamy sand.

In the IIIC horizon, the color ranges from 2.5Y to 5Y in hue, has a value of 4 or 5, and has a chroma of 3 or 4. The upper part of the IIIC horizon is a mixture of sand, gravel, and cobblestones, and the lower part generally is stratified. The depth to the IIIC horizon is commonly 16 inches but ranges from 15 to 24 inches.

Quonset soils are similar to Hinckley, Merrimac, and Warwick soils. Hinckley soils, however, lack the many fine fragments of dark-colored phyllite that occur throughout Quonset soils; Merrimac soils have about the same sequence of horizons but have a finer textured solum and lack the many fine fragments of phyllite; Warwick soils formed in similar material but are finer textured throughout the solum.

Raynham Series

The Raynham series consists of poorly drained soils that formed in thick deposits of very fine sand and silt.

Typical profile of a Raynham silt loam (2 percent slope, in a formerly cultivated area on Center Street, about 150 yards west of Union Street, in West Bridgewater):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; very strongly acid; abrupt, smooth boundary.

B21—8 to 13 inches, grayish-brown (2.5Y 5/2) silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive, breaks into large clods; friable; common roots; very strongly acid; abrupt, smooth boundary.

B22—13 to 19 inches, light-gray (2.5Y 7/2) silt loam; many, common, prominent, strong-brown (7.5YR 5/8) mottles; massive, breaks into large clods; firm; common roots; very strongly acid; abrupt, smooth boundary.

B23—19 to 26 inches, light brownish-gray (2.5Y 6/2) silt loam; many, coarse, prominent, strong-brown (7.5YR 5/6) mottles; massive, breaks into large clods; firm; common roots; strongly acid; abrupt, smooth boundary.

Cg—26 to 45 inches +, gray (5Y 6/1) silt loam; many, coarse, prominent, strong-brown (7.5YR 5/8) mottles; massive, breaks into large clods; firm to very firm; few roots in the upper part; medium acid.

The solum ranges from 17 to 30 inches in thickness. Except in limed fields, the reaction throughout the profile is commonly strongly acid or very strongly acid but ranges to slightly acid in the substratum.

In the Ap horizon, the color has a hue of 10YR or 2.5Y, a value of 4 or more, and a chroma of 1 or 2. In the A1 horizon, the hue commonly is 10YR, but the value is 2 and the chroma is 1 or 2, or the value is 3 and the chroma is 1. The A1 horizon ranges from 4 to 6 inches in thickness. The Ap horizon has weak, fine to medium, granular structure.

In the B horizon, the color generally has a hue of 2.5Y but ranges to 10YR in hue and from 4 to 7 in value. The chroma is 2 or less. The texture ranges from silt loam to very fine sandy loam. This material is massive, is coherent in place, and breaks into clods that have no evident planes of weakness. It is friable to firm.

In the C horizon, the color has a hue of 2.5Y or 5Y, a value of 5 or 6, and a chroma of 1 or 2. The texture is commonly silt loam but ranges to very fine sandy loam. The C horizon is massive, is coherent in place, and breaks into clods that have no evident planes of weakness. There is little or no contrast in color between freshly exposed surfaces and the interior of clods. Clay flows generally are not apparent under a 10X hand lens. The C horizon is firm to very firm. The mottles have a hue of 2.5YR, 7.5YR, or 5YR, a value of 2 to 5, and a chroma of 2 to 8.

Raynham soils formed in material similar to that in which Birdsall soils formed, but Birdsall soils are very poorly drained. Raynham soils are similar to Walpole soils, silty subsoil variant, in that both soils are underlain by silt and very fine sand, but Walpole soils have a fine sandy loam or sandy loam solum.

Raynham soils are the poorly drained members of a drainage sequence that includes the moderately well drained Belgrade soils and the very poorly drained Birdsall soils.

Saco Series

The Saco series consists of very poorly drained soils that formed in recent alluvium on flood plains. These soils are seasonally flooded.

Typical profile of a Saco very fine sandy loam (idle field on south bank of the Nemasket River, adjacent to its junction with the Taunton River, in Middleboro):

A1—0 to 9 inches, very dark gray (5Y 3/1) to dark gray (5Y 4/1) very fine sandy loam; weak, fine, granular structure; very friable; very strongly acid; abrupt, smooth boundary. 4 to 9 inches thick.

C1g—9 to 17 inches, very dark gray (10YR 3/1) very fine sandy loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable; very strongly acid; abrupt, smooth boundary.

C2g—17 to 30 inches +, gray to light-gray (5Y 6/1) silt loam; common, fine, prominent, strong-brown (7.5YR 5/6) mottles; massive; firm, slightly sticky; very strongly acid.

The Saco soils in Plymouth County are more acid than is typical for the Saco series.

The A1 horizon is commonly very dark gray or black. In places, the surface soil is black and mucky. The mucky material ranges from a trace to about 6 inches in thickness.

In the C horizon, the color generally has a hue of 10YR or 2.5Y but ranges to 5Y. The value ranges from 3 to 7, and the chroma is 1 or 2. The texture is commonly very fine sandy loam or silt loam but ranges to sandy loam and in many places is coarser textured below a depth of 12 inches. Structure and consistence vary only slightly from those described in the typical profile.

Saco soils resemble Birdsall soils in that their profiles are similar, but Birdsall soils are slightly finer textured and are more uniform in texture throughout the profile because they are not subject to periodic deposition from floods. Saco soils differ from the very poorly drained Brockton soils in that Brockton soils are coarser textured and have a fragipan.

Scarboro Series

The Scarboro series consists of very poorly drained soils that formed in thick deposits of sand or of sand and gravel. These soils are wet during much of the year and are very strongly acid.

Typical profile of a Scarboro sandy loam (wooded area off Furnace Street, opposite Ames Way, in Marshfield):

O2—6 inches to 0, decomposed organic matter; abrupt, smooth boundary.

A1—0 to 9 inches, very dark brown (10YR 2/2) sandy loam; weak, medium, granular structure; very friable; very strongly acid; abrupt, smooth boundary.

Bg—9 to 14 inches, gray to light-gray (N 5/0) loamy sand; single grain; few roots; very strongly acid; clear, smooth boundary.

IICg—14 to 48 inches +, gray (N 6/0) sand and gravel with a few, coarse, faint, strong-brown mottles; single grain; loose; very strongly acid.

Below the A horizon, the soil ranges from loamy sand to gravelly sand in texture and in some places is very gravelly coarse sand at a depth of about 18 inches. It is loose or very friable. In a few places it is weakly cemented at a depth of 2½ feet or more. The reaction is extremely acid to very strongly acid.

Typically, the color of the A1 horizon is very dark brown (10YR 2/2), but it ranges to black (N 2/0 or 10YR 2/1). In most places, the surface horizon is sandy loam, but it ranges to fine sandy loam and in places is mucky. The mucky horizon is from 4 to 12 inches thick. In the southeastern part of the county, where Scarboro soils are associated with Carver soils, the A1 horizon is loamy sand and is more than 10 inches thick.

The color of the B horizon is commonly gray (N 5/0) but ranges to grayish brown (2.5Y 5/2). In places the B horizon contains a few faint mottles of dark grayish brown (2.5Y 4/2) or light olive brown (2.5Y 5/4).

The color of the C horizon ranges from light gray (N 7/0) to dark gray (10YR 4/1).

Scarboro soils are similar to Au Gres, Saco, and Wareham soils but differ from those soils mainly in that Au Gres soils are better drained and have a dark reddish-brown B horizon, high in content of iron; Saco soils are finer textured; and Wareham soils are better drained and have a strongly mottled subsurface horizon.

Scarboro Series, Silty Subsoil Variant

The Scarboro series, silty subsoil variant, consists of very poorly drained soils that formed in sandy material, 18 to 24 inches thick, over silt and very fine sand.

Typical profile of a Scarboro fine sandy loam, silty subsoil variant (2 percent slope, wooded area on Plymouth Street, 0.3 mile east of intersection with Titicut Street, in Middleboro):

O1—5 to 3 inches, fresh leaf litter.

O2—3 inches to 0, dark reddish-brown (5YR 2/2), decomposed organic matter.

A1—0 to 10 inches, very dark gray (10YR 3/1) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; extremely acid; abrupt, smooth boundary.

C1g—10 to 22 inches, gray (5Y 5/1) loamy sand; single grain; loose; very strongly acid; abrupt, smooth boundary.

IIC2g—22 to 40 inches, gray to light-gray (5Y 6/1) silt loam; common, fine, prominent, brownish-yellow (10YR 6/6) mottles; massive; firm in place; breaks into clods at angle at which pressure is applied, with few indications of inherent planes of weakness; very strongly acid.

In the A1 horizon, the color ranges from 10YR to N in hue, and it has a value of 2 or 3 and a chroma of 1 or 2. The texture commonly is fine sandy loam. The A1 horizon either has weak, fine, granular structure or is structureless.

In the C horizon, the color ranges from 10YR to 5Y in hue and has a value of 5 or 6 and a chroma of 0 or 1. In some places the C horizon is faintly mottled. The texture ranges from loamy fine sand to sand. In the IIC horizon, the color ranges from 10YR to 5Y in hue and has a value of 5 or 6 and a chroma of 1 or 2. The IIC horizon is generally distinctly or prominently mottled. The texture is silt loam, silt, or very fine sand. Gen-

erally, clay films are not evident in the IIC horizon. Air-dried samples break into clods that have no evident planes of weakness. There is little or no contrast in color between the exterior and interior of the clods. The depth to the IIC horizon ranges from 18 to 24 inches.

Scarboro soils, silty subsoil variant, resemble soils of the Birdsall and Scarboro series and the silty subsoil variant of the Walpole series. Birdsall soils are similar in color to the silty subsoil variant of the Scarboro soils and have a similar substratum but have a silt loam solum; Scarboro soils are similar in color throughout the solum but are underlain by coarser textured material; Walpole soils, silty subsoil variant, are similar in textural sequence but have a distinctly mottled subsurface layer.

Scarboro soils, silty subsoil variant, are the very poorly drained members of a drainage sequence that includes the well drained Agawam soils, silty subsoil variant; the moderately well drained Ninigret soils, silty subsoil variant; and the poorly drained Walpole soils, silty subsoil variant.

Scituate Series

The Scituate series consists of moderately well drained soils that formed in compact glacial till derived principally from granite and gneiss. These soil are intermittently wet.

Typical profile of a Scituate sandy loam (2 percent slope, hayfield on Walnut Street, 300 yards north of Center Street, in East Bridgewater):

Ap—0 to 11 inches, very dark grayish-brown (10YR 3/2) sandy loam; weak, medium, granular structure; very friable; many roots; 15 percent coarse fragments that are mostly subangular gravel; medium acid; abrupt, smooth boundary.

B21—11 to 15 inches, yellowish-brown (10YR 5/4) sandy loam; weak, medium, granular structure; very friable; many roots; 15 to 20 percent subangular gravel; medium acid; abrupt, smooth boundary.

B22—15 to 20 inches, brownish-yellow (10YR 6/6) sandy loam; many, coarse, prominent, yellowish-red (5YR 4/8) mottles; soft subangular clods break into fine and medium granules; friable; 10 percent gravel; medium acid; clear, smooth boundary.

C1x—20 to 25 inches, light yellowish-brown (10YR 6/4) sandy loam; many, coarse, prominent, yellowish-red (5YR 5/8) mottles; massive; very firm; 15 percent gravel; very strongly acid; clear, smooth boundary.

C2x—25 to 36 inches, light yellowish-brown (2.5Y 6/4) sandy loam; common, coarse, distinct, yellowish-red (5YR 5/8) mottles; massive; firm; 10 percent gravel; very strongly acid; gradual, smooth boundary.

C3x—36 to 46 inches, light yellowish-brown (2.5Y 6/4) loamy coarse sand; common, medium, distinct, yellowish-red (5YR 5/8) mottles; massive, breaks into very coarse, subangular blocks if removed; very firm; contains large polygons of fine sand that have a pale-brown (10YR 6/3) core and a yellowish-red oxide rind; 15 percent gravel; very strongly acid; abrupt, smooth boundary.

C4—46 to 58 inches +, light brownish-gray (10YR 6/2) loamy coarse sand; few, fine, faint mottles; single grain; loose; 15 percent gravel; very strongly acid.

The upper part of the solum generally has weak, granular structure, but the lower part is generally massive. These soils are loose or very friable in the solum and range from firm to very firm in the Cx horizon. The solum ranges from 18 to 30 inches in thickness. Except in limed fields, the reaction is medium acid to extremely acid. Stones on the surface are between 1 and 2 feet in diameter and are from 2 to 20 feet apart. In places stones have been removed to permit tillage.

The Ap horizon is typically very dark grayish brown (10YR 3/2), but the color ranges from 2.5Y to 7.5YR in hue, has a value of 3 or 4, and has a chroma of 2 or 3. The surface horizon is commonly sandy loam, but in many areas it is very stony or extremely stony. Where an A2 horizon occurs, the hue is 10YR, the value is 4 to 6, and the chroma is 1 or 2.

In the B21 and B22 horizons, the color typically has a hue of 10YR but ranges to a hue of 2.5Y. In the B21 horizon, the color has a value of 4 to 6 and a chroma of 4 to 6. In the B22 horizon, the color has a value of 5 to 6 and a chroma of 2 to 6. The B horizon is predominantly sandy loam that is relatively high in coarse sand and very coarse sand, but it ranges to loamy sand.

The Cx horizon is predominantly light yellowish brown (2.5Y 6/4). The texture ranges from sandy loam to loamy coarse sand and in places is gravelly. In most places the Cx horizon is massive, but in a few places it has weak, platy structure. The mottles are distinct to prominent and have a hue of 5YR or 7.5YR, a value of 5, and a chroma of 6 or 8.

Scituate soils are similiar to Essex and Pittstown soils, but Essex soils are better drained, and they have no mottles within the B horizon. Pittstown soils are finer textured, and the lower part of their B horizon is olive instead of brownish yellow.

Scituate soils are the moderately well drained members of a drainage sequence that includes the somewhat excessively drained Gloucester soils, the well-drained Essex soils, the poorly drained Norwell soils, and the very poorly drained Brockton soils.

Tisbury Series

The Tisbury series consists of moderately well drained soils that formed in a mantle of very fine sand and silt over sand and gravel.

Typical profile of a Tisbury very fine sandy loam (5 percent slope, hayfield on Clifford Avenue, north of Old Sandwich Road, in Plymouth):

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) very fine sandy loam; weak, fine, granular structure; very friable; many fine fibrous roots; strongly acid; abrupt, smooth boundary.

B21—8 to 18 inches, yellowish-brown (10YR 5/4) very fine sandy loam; massive; clods break into medium granules; very friable; common fine roots; few scattered rounded pebbles; very strongly acid; clear, smooth boundary. 10 to 12 inches thick.

B22—18 to 26 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; massive; clods break into medium granules; very friable; very strongly acid; abrupt, smooth boundary. 10 to 11 inches thick.

B23—26 to 30 inches, very pale brown (10YR 7/4) very fine sandy loam; common, coarse, distinct, strong-brown (7.5YR 5/6) mottles; massive; very friable; very strongly acid; abrupt, wavy boundary. 6 to 7 inches thick.

IIC—30 to 40 inches +, light yellowish-brown (10YR 6/4) coarse sand and gravel; single grain; loose; numerous large particles of quartz and feldspar, and few dark-colored minerals; strongly acid.

The solum ranges from 24 to 30 inches in thickness. There is only slight variation in texture throughout the solum. The texture is typically very fine sandy loam. The depth to mottling ranges from 16 to 20 inches. The substratum is gravelly sand or coarse sand and gravel. Cobblestones occur on the surface in a few places.

The Ap horizon is typically dark brown (7.5YR 3/2), but the color ranges to a hue of 10YR and has a value of 3 and a chroma of 2 or 3.

In the B horizon, the color ranges from 10YR to 2.5Y in hue, has a value of 4 to 7, and has a chroma of 4. The value increases with depth.

In the IIC horizon, the color ranges from 10YR to 5Y in hue, has a value of 6 or 7, and has a chroma of 2 to 6.

The mottles are distinct to prominent and have a hue of 7.5YR or 5YR, a value of 5 or 6, and a chroma of 6 or 8.

Tisbury soils are similar to Enfield soils in texture and in horizon sequence. They differ mainly in that Enfield soils are well drained and are free of mottling in the lower part of the solum. Tisbury soils are also similar to Deerfield soils and to the silty subsoil variant of the Ninigret soils, but Deerfield soils have a loamy sand solum, and Ninigret soils have a sandy loam solum.

Walpole Series, Silty Subsoil Variant

The Walpole series, silty subsoil variant, consists of poorly drained soils that formed in sand, 12 to 20 inches thick, over very fine sand and silt.

Typical profile of a Walpole fine sandy loam, silty subsoil variant (level or nearly level wooded area on Washington Street, 200 yards north of intersection with Crescent Street, in East Bridgewater) :

O1—4 to 2 inches, litter of leaves and twigs, fresh and partly decomposed.

O2—2 inches to 0, black (N 2/0) decayed leaf litter; many fine, fibrous roots.

A1—0 to 4 inches, very dark gray (10YR 3/1) fine sandy loam; weak, fine, granular structure; very friable; many roots; extremely acid; abrupt, wavy boundary.

B21—4 to 10 inches, dark grayish-brown (10YR 4/2) fine sandy loam; common, coarse, distinct, light yellowish-brown (10YR 6/4) mottles and few, medium, distinct, reddish-brown (5YR 4/4) mottles; weak, fine, granular structure; very friable; few fine roots, chiefly in the upper part; extremely acid; clear, wavy boundary.

B22—10 to 20 inches, brown (10YR 5/3) sandy loam; common, coarse, faint, dark grayish-brown (10YR 4/2) mottles; very weak, granular structure or single grain; loose; extremely acid; abrupt, smooth boundary.

IIC—20 to 32 inches, light olive-gray (5Y 6/2) silt loam; many, coarse, faint, light brownish-gray (10YR 6/2) mottles and few, coarse, prominent, strong-brown (7.5YR 5/6) mottles in the upper part; massive; firm in place, breaks into clods that are slightly firm; many pores; very strongly acid.

These soils are friable or very friable in the solum and friable to firm in the substratum. The solum ranges from 12 to 20 inches in thickness.

In the A1 horizon, the color ranges from black (N 2/0) to dark reddish brown (5YR 2/2) but typically is very dark gray. The texture is commonly fine sandy loam.

In the B horizon, the color ranges from 10YR to 2.5Y in hue, from 4 to 6 in value, and from 1 to 3 in chroma. The texture is predominantly fine sandy loam or sandy loam.

In the IIC horizon, the color commonly has a hue of 5Y, a value of 4 to 6, and a chroma of 2. The IIC horizon consists of silt loam or of lenses of silt and very fine sand. This material is massive and firm in place but friable if removed. Characteristically, it breaks into clods at the angle at which pressure is applied and not at developed or inherent planes of weakness. There is little or no difference in color between the exterior and interior of the clods. Few or no clay films are evident in pores.

Walpole soils, silty subsoil variant, are similar in profile sequence to the silty subsoil variant of the Scarboro soils, but they differ from those soils mainly in that Scarboro soils are wetter, have gray colors that are lower in chroma, and have a coarser textured subsurface layer. Au Gres and Wareham soils have a coarser textured solum than Walpole soils, and they are underlain by sand and gravel instead of silt loam.

Walpole soils, silty subsoil variant, are the poorly drained members of a drainage sequence that includes the well drained Agawam soils, silty subsoil variant; the moderately well drained Ninigret soils, silty subsoil variant; and the very poorly drained Scarboro soils, silty subsoil variant.

Wareham Series

The Wareham series consists of poorly drained soils that formed in thick deposits of sand or gravelly sand.

Typical profile of a Wareham loamy sand (wooded area east of Park Street, at town line, in Mattapoisett) :

O1—3 to 2 inches, partly decomposed leaf litter.

O2—2 inches to 0, dark reddish-brown (5YR 2/2) organic matter; abundant roots; abrupt, smooth boundary.

A1—0 to 4 inches, black (N 2/0) loamy sand; single grain; loose; abrupt, smooth boundary.

A2—4 to 6 inches, grayish-brown (2.5Y 5/2) loamy sand; many, coarse, distinct, strong-brown (7.5YR 5/8) mottles; single grain; loose; extremely acid; abrupt, broken boundary. 0 to 3 inches thick.

B2—6 to 18 inches, light brownish-gray (10YR 6/2) gravelly loamy sand; many, prominent, reddish-brown mottles; single grain; loose; 15 to 20 percent gravel; very strongly acid; clear, smooth boundary. 12 to 16 inches thick.

C1—18 to 40 inches, pale-brown (10YR 6/3) gravelly sand; a few lenses of reddish iron oxide; single grain; loose; 20 percent gravel; very strongly acid; clear, smooth boundary. 20 to 24 inches thick.

C2—40 to 48 inches +, light reddish-brown (5YR 6/3) gravelly sand; single grain; loose; 20 percent gravel; strongly acid.

The solum ranges from 15 to 30 inches in thickness. The upper part either has weak, fine, granular structure or is structureless. The lower part is single grain.

The A1 horizon is commonly black (N 2/0). The surface horizon is commonly loamy sand. In the A2 horizon, the color has a hue of 2.5Y or 5Y, a value of 5 or 6, and a chroma of 1 or 2. In the Ap horizon, the color ranges from 5Y to 10YR in hue, has a value of 2 or 3, and has a chroma of 1 or 2.

In the B horizon, the color typically has a hue of 10YR but ranges to 5Y in hue, from 5 to 6 in value, and from 2 to 4 in chroma.

Mottles are distinct or prominent. They have a hue of 7.5YR or 5YR, a value of 4 to 6, and a chroma of 4 to 8. The B horizon ranges from loamy sand to gravelly sand.

The C horizon is gravelly sand or sand.

Wareham soils are similar to Au Gres and Scarboro soils. They differ from those soils mainly in that Au Gres soils have a B horizon high in content of iron, and Scarboro soils are wetter and have a thicker surface horizon and a more strongly gleyed subsurface horizon.

Wareham soils are the poorly drained members of a drainage sequence that includes the very poorly drained Scarboro soils, the moderately well drained Deerfield soils, and the excessively drained Hinckley and Windsor soils.

Warwick Series

The Warwick series consists of well-drained and somewhat excessively drained soils that formed in sand and gravel derived from dark-colored phyllite.

Typical profile of a Warwick fine sandy loam (1 percent slope, hayfield on Mill Street, west of Third Herring Brook in Hanover) :

Ap—0 to 11 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; weak, fine, granular structure; very friable; many roots; 5 to 10 percent gravel and cobblestones; slightly acid; abrupt, smooth boundary. 8 to 11 inches thick.

B21—11 to 16 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, granular structure; very friable; few roots; 10 to 15 percent gravel and cobblestones; strongly acid; abrupt, smooth boundary. 3 to 5 inches thick.

B22—16 to 25 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, fine, granular structure; very friable; few roots; 15 to 20 percent gravel and cobblestones; very strongly acid; abrupt, smooth boundary. 8 to 10 inches thick.

B3—25 to 30 inches, light olive-brown (2.5Y 5/4) gravelly sandy loam; single grain; loose to very friable; few roots; 35 to 45 percent gravel and cobblestones; very strongly acid; clear, wavy boundary. 3 to 5 inches thick.

IIC—30 to 34 inches +, olive-brown (2.5Y 4/4) very gravelly sand; single grain; loose; 50 to 70 percent gravel and cobblestones; no roots; very strongly acid.

The solum ranges from 18 to 30 inches in thickness. The upper part of the solum has weak, fine, granular structure. The lower part and the substratum are single grain. In unplowed areas there is a 1- to 4-inch A1 horizon.

The Ap horizon is typically dark yellowish brown (10YR 3/4), but the color ranges from 10YR to 2.5Y in hue and has a value and chroma of 3 or 4.

In the B21 horizon, the color has a hue of 10YR or 2.5Y, a value of 3 to 5, and a chroma of 3 or 4. In the lower part of the B horizon, the color has about the same hue as that of the upper part, but in places the value is higher and the chroma is lower. The B horizon commonly is sandy loam or fine sandy loam, but in some places the B3 horizon is coarser textured.

In the IIC horizon, the color has a hue of 2.5Y or 5Y, a value of 3 or 4, and a chroma of 2 to 4. The IIC horizon is generally stratified sand and gravel.

Enfield, Merrimac, and Quonset soils are similar to Warwick soils. Enfield soils are similar in profile sequence but have a finer textured solum and have a substratum that is high in quartz; Merrimac soils are similar in texture but contain smaller amounts of dark-colored minerals; and Quonset soils formed in similar material, but they have a coarser textured solum and are higher in content of gravel.

Windsor Series

The Windsor series consists of excessively drained soils that formed in thick deposits of sand.

Typical profile of a Windsor loamy sand (level area, idle field on Titicut archeological site, off Beach Street, in Bridgewater):

Ap—0 to 9 inches, dark-brown (10YR 3/3) loamy sand; single grain; loose; many fine roots; abrupt, smooth boundary.

B21—9 to 12 inches, strong-brown (7.5YR 5/6) loamy fine sand; single grain; loose; common roots; clear, smooth boundary.

B22—12 to 20 inches, light yellowish-brown (10YR 6/4) sand; single grain; loose; few pebbles; clear, smooth boundary.

B23—20 to 31 inches, pale-yellow (2.5Y 7/4) coarse sand; single grain; loose; scattered pebbles; clear, smooth boundary.

C—31 to 41 inches, light-gray (2.5Y 7/2) and light olive-gray (5Y 6/2) sand; single grain; loose; few pebbles.

The solum ranges from 24 to 32 inches in thickness. In some places the surface horizon has weak, crumb structure, but generally these soils are single grain and loose. The solum and substratum contain a few pebbles, and in places there are strata of gravel below a depth of 42 inches. Most of the acreage has been tilled, although at the present time this acreage is forested.

In the Ap horizon, the color commonly has a hue of 10YR and a value and chroma of 3 or 4. The surface horizon is loamy sand or loamy fine sand.

In the B21 horizon, the color has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 4 to 8. In the lower part of the B horizon, the color has a hue of 10YR or 2.5Y, a value of 5 to 7, and generally a chroma of 4. The B horizon ranges from sand to loamy fine sand.

In the C horizon, the color ranges from 10YR to 5Y in hue, from 6 to 7 in value, and from 2 to 6 in chroma.

Windsor soils are similar to Agawam, Carver, and Hinckley soils. They differ from those soils mainly in that Agawam soils have a finer textured solum; Carver soils are coarser textured and are higher in content of coarse quartz particles; and Hinckley soils have a gravelly solum and a very gravelly substratum.

Windsor soils are the excessively drained members of a drainage sequence that includes the moderately well drained Deerfield soils, the poorly drained Au Gres and Wareham soils, and the very poorly drained Scarboro soils.

Laboratory Data

Data on the physical and chemical properties of some selected soil profiles sampled in Plymouth County are published in Soil Survey Investigations Report No. 20. The soils that were sampled are considered representative of their respective series as they occur in Plymouth County. Included in the published survey are data from samples taken during the course of a special study of Indian mounds to determine the extent of profile development in material of known age.

Samples were collected from each horizon in each profile. The data from these samples are helpful in characterizing and classifying the soils in Plymouth County and in understanding their genesis. This information is also useful in making interpretations for use and management. Analyses were made at the Soil Survey Laboratory at Beltsville, Maryland.

Particle-size distribution in the Essex soils is that expected in soils originating in glacial till derived from granite. The Carver profiles show the work of other transporting agents. Several breaks in continuity of material are suggested by the results of these analyses.

In the Essex coarse sandy loam profile (S57 Mass. 12–1), a change occurs between the B21 and B22 horizons. Somewhat less silt occurs in the B22 horizon, and more coarse, medium, and fine sand. From the B22 horizon through the rest of the profile, the amount of fine silt increases gradually and the amount of coarser constituents decreases.

The other Essex coarse sandy loam profile (S57 Mass. 12–3) is consistent throughout and, in particle-size distribution, is quite similar to the B22 horizon and to the lower horizons of the Essex coarse sandy loam profile (S57 Mass. 12–1).

A particle-size analysis of a representative Norwell sandy loam (S57 Mass. 12–8) shows a similar distribution. This profile has a sandy loam Ap horizon at 0 to 7 inches, a loamy coarse sand C1 horizon at 7 to 14 inches, a loamy sand C2 horizon at 14 to 16 inches, a loamy coarse sand C3 horizon at 16 to 21 inches, a loamy coarse sand C4x horizon at 21 to 35 inches, and a sandy loam IIC5x horizon at 35 to 43 inches. The particle-size analysis shows that the Ap horizon closely resembles the IIC horizon, that the C1 horizon is intermediate between the C2 and C3 horizons, and that the C4x horizon is intermediate between the C3 and IIC horizons.

Taken as a whole, the particle-size distribution in the three soils discussed strongly reflects their glacial origin. In some cases the silt content of the upper horizons exceeds that of the lower horizons. This indicates differences in deposition of the till or influence of eolian material.

In both Essex soils, the horizon immediately above the fragipan contains more silt and clay than the overlying horizons. This increase indicates possible translocation of fine particles by percolating water. Silt caps on the upper surface of coarse fragments are common in many of the coarse-textured lower subsoil horizons and are another indication of the downward movement of fine particles. The total accumulation is not sufficient to be the basis for a diagnostic feature. In the Norwell soil (S57 Mass. 12–8), a sample was collected from the rind and from the matrix of a well-developed polygon. The polygon matrix is 35.3 percent silt and 5.9 percent clay, and the rind is 33.2 percent silt and 4.9 percent clay. The slight difference in particle-size distribution between the rind and the matrix may represent some translocation of silt and clay in the zone of a fluctuating water table.

Carver coarse sand (S57 Mass. 12–2) has approximately the same size distribution from the surface through the B22 horizon. There is a transitional B23 horizon between the B22 and C2 horizons. The fine constituents are missing from the C2 horizon. Carver loamy coarse sand (S57 Mass. 12–5) has a profile similar to that of the upper horizons of Carver coarse sand (S57 Mass. 12–2), except for the unconforming IIC horizons. Both IIC horizons are extremely well sorted. The other two Carver soils (S59 Mass. 12–1 and S59 Mass. 12–2) show similar particle-size distribution.

The moisture tension determinations reflect the similarity of the particle-size distribution in the upper horizons of the soils derived from till. They also reflect the shift to sandier lower horizons in most of these profiles. The Carver profiles show a similar shift, but the upper horizons are sandier to start with than the other soils.

Base exchange capacities in these soils are low because of the small amount of clay. Values are somewhat higher where the soils are influenced by organic matter. For the most part, exchange capacities per 100 grams of clay are rather high. Base saturation is low in all profiles.

Although field and laboratory data indicate some discontinuities in parent material, values for cation exchange capacity, base saturation, organic carbon, and free iron oxides are such that considerable equilibrium with the environment is indicated.

Data on the Carver soils indicate a close relationship between organic matter and base exchange capacity in these clay-poor soils. In undisturbed sites, the bulk of the exchange capacity is concentrated in a relatively thin surface horizon, which is obliterated by plowing, and the exchange capacity, in effect, is diluted in the plow layer.

The Windsor samples (S54 Mass. 12–5) were collected during the course of a special study undertaken by W. H. Coates, State soil scientist, and Dr. J. H. Hartshorn, of the U.S. Geological Survey, to determine the extent of profile development in material of known age. Charcoal from an Indian hearth beneath the site was dated 4,500±300 years (radioactive carbon dating by W. F. Libby). Laboratory data indicate that a normal Brown Podzolic (Entic Haplorthod) soil has developed. It may be concluded that this profile developed in a period of 4,500 years or less, since the time required to cover the hearth is unknown.

The samples of the two Carver soils (S57 Mass. 12–2 and S57 Mass. 12–5) were collected in the vicinity of another archeological site for which radiocarbon dates are available. A log collected by Dr. Hartshorn, from a hearth buried under 40 inches of eolian sand in which a normal profile has developed, antedates eolian activity and soil development. Its age was determined to be 4,320±250 years. However, the data on the two Carver soils show a bimodal sequence in particle-size distribution in the upper part of both profiles. The water-washed appearance of the gravel and the polymodal distribution indicate fluvial deposition instead of eolian, and these profiles probably antedate those at the archeological sites.

The laboratory data for the four Carver pedons sampled show that only one of the pedons meets the requirements for a spodic horizon based on the content of carbon and free iron. All the Carver pedons have very low cation exchange capacity. The cation exchange capacity is highest in the Ap and B21 horizons.

Additional Facts About the County

This section contains information about the settlement and development of Plymouth County, the water supply, transportation, climate, and agriculture.

Settlement and development

Plymouth County was first settled by Europeans in 1620 when the Plimoth Plantation was established. The Colony of New Plymouth, formed in 1629, originally included what is now Bristol and Barnstable Counties, as well as Plymouth County. Three separate counties were established in 1685, and Plymouth became part of the Province of Massachusetts in 1691.

Early colonial enterprises consisted mainly of subsistence farming, fishing, and lumbering. Shipbuilding and iron making were soon added. The original forests furnished lumber for export, for shipbuilding, and for the manufacture of charcoal to be used in iron smelting. Many of the swamps in Plymouth County were sources of ore in the form of bog iron.

As land was cleared, it was used for pasture. Locally grown beef and mutton supplied the city markets. The opening of the West, following the Civil War, brought about a decline in this kind of farming. Industrial activity increased, and land formerly pastured was allowed to revert to forest. The Brockton area became a shoe manufacturing center. Present industry in the county includes the manufacture of diverse products ranging from plastics and electronic components to nails and steel castings.

The trend from city to suburban dwelling has caused a rapid increase in the population of Plymouth County. By 1960 the population was nearly 250,000. Many residents commute to work in the metropolitan Boston area, and small industries have increased employment opportunities within the county.

Water supply

Plymouth County is drained by five watersheds. The central and western parts are drained by the Taunton River and a main tributary, the Town River, which flow southwesterly into Narragansett Bay. The eastern and northern parts drain into Cape Cod Bay via the North River, the Jones River, and several other independent streams. The southern part is drained by the Weweantic River into Buzzards Bay. The southwestern border drains into Buzzards Bay by way of the Mattapoisett River.

The many lakes and ponds in the county provide water for municipal use, but wells are also used for this purpose. Silver Lake and other nearby lakes are the main source of water for much of the Brockton area. In the southwestern part, several large ponds provide water for cities outside the county.

Transportation

Plymouth County has an excellent network of highways. Most goods are transported by motortruck. Limited access highways allow rapid travel to points both within and outside the county.

Climate [7]

Plymouth County is characterized by moderately warm summers, moderately cold winters, and ample rainfall. The climate is influenced to some extent by the proximity of the Atlantic Ocean, Cape Cod Bay, and Buzzards Bay. In summer the immediate coastline is most affected by cooling sea breeezes, but the temperature throughout the county is moderated by the passage of heat-laden southerly or southwesterly winds over the cooling sea surface. In winter the temperature is less likely to be affected because winds are more often from westerly to northerly directions. The many ponds, marshes, and lakes within the county also tend to moderate extreme temperatures. Nevertheless, because prevailing winds are from the west, the climate is dominantly continental. Temperatures differ widely from winter to summer and from day to night. There is also considerable variation in temperature from day to day because the county is near the path of a weather system that alternately brings in warm and cold air from southerly and northerly directions.

The elevation above sea level is predominantly less than 100 feet in Plymouth County, although many hills rise to as much as 200 feet, and a few are higher. The range in elevation is too small to be a controlling factor in climate but is important because of its effect on minimum temperatures. On clear nights, as air is cooled by radiation it becomes heavier and drains into the low areas, or bogs. In addition, because of the low heat conductivity of bog soils, their surface becomes colder at night than that of mineral soils. Consequently, frost is a threat to cranberries or other crops grown on bog soils, even in summer months.

Weather Bureau stations in the county are located at Brockton, East Wareham, Plymouth, and Rochester. Table 11 gives temperature and precipitation data recorded at three stations located in different parts of the county. Table 12 contains data on the frequency of specified temperature levels and accumulated heat units (degree-days), and table 13 contains data on the growing season in different parts of the county.

Temperature.—Table 11 does not give the extreme high and low temperatures ever recorded but rather a probability of the occurrence of specified temperatures. For purposes of planning, these probabilities commonly are more useful than recorded extremes. In general, however, the monthly extremes, averaged over many years, differ only slightly from the values shown in the table for the high and low temperatures that are likely to occur on at least 4 days of the month, in at least 2 years out of 10. That is, these values may be used as estimates of the single high or low value to be expected for any month.

The average monthly temperature in the county is higher than 55° F. for each of the five months, May through September. Except for some urban and protected coastal areas, the average temperature in January is 30° or colder. The average temperature in July is in the low 70's. In an average summer, a temperature of 90° is likely on 15 days at Brockton, on a few days near Buzzards Bay, and on 4 days at East Wareham. Nights generally are cool, even in the warmest summers.

Table 12 contains data on the frequency of specified temperature levels and accumulated heat units (degree-days).

Data on heating degree-days are computed by recording significant average departures from a selected temperature base each day and by summarizing these departures for the month and for the year. The temperature selected as a base and the departures to be recorded depend on the purpose of the computation. A base of 65° F. is used for computing heating degree-days as this is the lowest average daily temperature at which no heat is required for homes. To get the departure for one day, the actual average temperature, if less than 65°, is subtracted from 65°. For example, a day with an average temperature of 55° has a value of 10 heating degree-days. In contrast, a day with an average of 65° or more has none because no heat is required. This information is useful in calculating the amount of fuel needed in an average year and in comparing a particular season with the average. It is used by gas, electric, and fuel companies in estimating fuel and power requirements.

Data on growing degree-days are useful in planning the planting and harvesting of crops. Growing degree-days accumulate when the average temperature is higher than the lowest average temperature at which plants continue to grow and develop. They are calculated by subtracting this base temperature from the actual average temperature for the day. The data in table 12 are calculated from two standard bases: 40° for cool-weather crops, such as grasses, potatoes, and peas; and 50° for warm-weather crops, such as corn. Thus, a day on which the average temperature is 60° accounts for 20 growing degree-days for cool-weather crops but only 10 for warm-weather crops.

Table 13 shows the probability of freezing temperatures after specified dates in spring and before specified dates in fall. At Brockton, for example, there remains one chance in 10 that the temperature will drop to 32° F. or lower after May 27, and eight chances in 10 that this temperature

[7] By Robert E. Lautzenheizer, State climatologist, U.S. Weather Bureau, Boston, Mass.

TABLE 11.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature					Precipitation						
	Average daily--			Two years in 10 will have at least 4 days with--		Average total	One year in 10 will have--		Average snowfall	Days with--		
	Maximum	Minimum	Mean	Maximum temperature equal to or higher than--	Minimum temperature equal to or lower than--		Less than--	More than--		Snowfall of 1 inch or more	Snow cover 1 inch deep or more	Precipitation of 0.10 inch or more
	°F.	°F.	°F.	°F.	°F.	In.	In.	In.	In.	Days	Days	Days
Brockton (Elevation 80 feet)												
January----	38.9	19.3	29.1	55	-2	3.56	1.5	6.1	10.8	3	10	7
February---	40.0	19.9	30.0	55	-4	3.11	1.2	5.0	10.8	3	11	6
March------	47.0	26.9	37.0	65	14	3.89	2.0	6.1	8.3	2	6	8
April------	59.3	36.0	47.7	76	28	3.73	1.9	6.4	.7	(1/)	(1/)	7
May--------	70.4	44.6	57.5	86	35	3.01	1.3	5.1	0	0	0	7
June-------	77.9	54.0	66.0	93	43	3.11	1.6	6.3	0	0	0	6
July-------	83.3	59.8	71.6	93	52	2.95	.7	5.7	0	0	0	5
August-----	81.9	58.3	70.1	94	48	3.72	1.3	6.7	0	0	0	6
September--	74.9	51.4	63.2	87	39	3.69	.8	7.6	0	0	0	5
October----	65.2	40.8	53.0	78	29	3.09	.8	6.3	.1	(1/)	(1/)	5
November---	53.5	32.5	43.0	68	20	3.89	1.0	7.2	1.2	(1/)	1	6
December---	41.6	21.9	31.8	57	-5	3.30	1.3	6.4	6.5	2	5	6
Year-----	61.2	38.8	50.0	2/97	3/-4	41.05	27.9	54.5	38.4	10	33	74
East Wareham (Elevation 18 feet)												
January----	38.5	19.5	29.0	54	-1	4.30	2.0	7.4	7.5	3	9	8
February---	38.7	19.3	29.0	51	-5	3.54	1.6	5.4	7.2	2	9	7
March------	45.0	27.2	36.1	57	12	4.80	2.4	7.7	6.6	2	5	9
April------	55.1	36.3	45.7	67	26	4.28	1.9	6.9	.1	(1/)	(1/)	7
May--------	65.9	45.8	55.9	78	34	3.45	1.4	6.6	0	0	0	7
June-------	74.3	55.0	64.7	86	44	3.26	.3	6.7	0	0	0	6
July-------	80.8	61.2	71.0	88	51	2.88	.7	5.0	0	0	0	5
August-----	79.6	59.9	69.8	88	47	4.29	1.1	6.9	0	0	0	6
September--	72.7	52.9	62.8	85	39	3.84	1.0	7.5	0	0	0	5
October----	63.2	42.6	52.9	75	30	3.44	1.2	5.6	(4/)	0	0	6
November---	53.0	33.4	43.2	65	21	4.60	1.8	8.3	.5	(1/)	1	8
December---	41.5	22.2	31.9	55	-4	4.20	2.0	6.8	5.1	2	6	7
Year-----	59.0	39.6	49.3	2/93	3/-6	46.88	37.2	56.3	27.0	9	30	81

Plymouth (Elevation 25 feet)

January----	39.0	22.5	30.8	55	-5	4.17	2.0	7.0	9.4	3	10	7
February---	39.9	22.5	31.2	54	-7	3.46	1.5	5.7	9.3	3	9	7
March------	46.5	29.0	37.8	65	15	4.49	2.1	7.9	7.0	2	5	8
April------	56.6	37.9	47.3	75	28	4.15	1.8	7.8	.3	(1/)	(1/)	7
May--------	67.8	47.4	57.6	83	38	3.49	1.7	6.3	0	0	0	7
June-------	76.4	56.6	66.5	89	47	3.28	1.3	5.7	0	0	0	6
July-------	81.6	62.7	72.2	91	53	2.92	.8	5.1	0	0	0	6
August-----	79.7	61.7	70.7	93	51	4.20	1.3	8.5	0	0	0	6
September--	73.0	55.2	64.1	86	42	3.96	.9	7.1	0	0	0	5
October----	63.8	45.7	54.8	78	32	3.65	1.3	5.9	(4/)	0	0	6
November---	53.6	36.4	45.0	68	23	4.46	1.6	8.1	.6	(1/)	(1/)	7
December---	42.0	25.5	33.8	59	-8	4.02	1.6	6.6	5.3	2	5	7
Year-----	60.0	41.9	51.0	2/95	3/-1	46.25	35.8	60.3	31.9	10	29	79

1/ Less than 0.5 day.

2/ Average annual highest maximum.

3/ Average annual lowest minimum.

4/ Trace.

will be recorded after May 1. There is a 50 percent chance of a 32° freeze after May 11. A 32° freeze generally is seriously damaging to sensitive plants, although hardier plants may withstand lower temperatures. Probabilities for various lower thresholds are given also in this table.

The average length of the freeze-free season ranges from 146 days at Brockton to 174 days at Plymouth. The season may be slightly longer in the best protected coastal and urban areas. In some low areas, especially in bogs, frost may be a threat even occasionally in summer.

PRECIPITATION.—Table 11 includes precipitation data recorded at stations in different parts of the county. The annual precipitation ranges from about 41 to 47 inches. It is distributed remarkably evenly among the seasons. Nearly 50 percent falls during the six warmer months.

Snowfall varies considerably from year to year, and in any given year it varies markedly from one part of the county to another. The seasonal total ranges from about 27 to 38 inches, with the least along the coast. A snow cover of prolonged duration is not common. The ground may be bare of snow much of the time during a normal winter and for shorter periods even in the more severe winters. The average seasonal number of days with a snow cover of 1 inch or more ranges from about 29 at Plymouth to 44 at Rochester. The average seasonal maximum depth of snow on the ground ranges from 9 inches at East Wareham to 13 inches at Brockton. The average date of the maximum snow depth is about February 8. Brockton has reported yearly maximum snow depths ranging from only 2 inches in 1936–37 to 34 inches in 1947–48.

From data recorded at Brockton, the probabilities of specified amounts of snowfall in a day have been calculated as follows:

Amount	*Frequency*
4 inches or more	0 to 8 times per season; average 4 times.
8 inches or more	0 to 4 times; average 1 time.
10 inches or more	0 to 2 times; average about 1 season in 2, with 2 occurrences in 1 season in 10.

From data recorded at East Wareham, the probabilities of specified amounts of snowfall in a day have been calculated as follows:

Amount	*Frequency*
4 inches or more	0 to 5 times per season; average 2 times.
8 inches or more	0 to 2 times; average less than 1 time.
10 inches or more	About 1 season in 10.

From data recorded at Plymouth, the probabilities of specified amounts of snowfall in a day have been calculated as follows:

Amount	*Frequency*
4 inches or more	0 to 5 times; average 3 times.
8 inches or more	0 to 3 times; average about 1 time.
10 inches or more	0 to 2; average about 1 season in 3.

EVAPORATION.—Evaporation from a standard 48-inch diameter pan is recorded at Rochester. No observations are made during the cold season. Evaporation from lakes and reservoirs generally is about 20 percent less than that from a standard pan. The evaporation rate is greatest during July, although July rates have varied from 7.56 inches in 1952 to only 4.70 inches in 1958. Data recorded at Rochester indicate that the average monthly total pan evaporation is 3.05 inches in April, 4.44 inches in May, 5.45 inches in June, 5.74 inches in July, 4.74 inches in August, 3.47 inches in September, and 2.08 inches in October—a total of 28.97 inches for the seven months.

STORMS.—Wind and hail from thunderstorms are the principal cause of damage to crops. Thunderstorms can be expected on from 15 to 30 days each year. They are most frequent from May through August but may occur in any month. The heavy rains that accompany the more severe thunderstorms erode the soil, injure plants, and probably do more damage than lightning. Spring and summer thunderstorms are occasionally accompanied by hail. Hailstorms occur once or twice a year, but the hailstones are seldom large enough or numerous enough to cause extensive damage.

Wind and heavy rain from hurricanes cause some damage in the county once in 4 or 5 years. Strong winds and heavy rain from coastal storms, or northeasters, are more frequent but generally do not cause serious damage. Tornadoes are uncommon and generally affect only small areas. Few cause personal injury or significant property damage.

Agriculture

Plymouth County produces a wide variety of agricultural products. About 9,000 acres are used for the production of cranberries. Much of the marketing and distribution of this crop is handled by a grower's cooperative, which has two cold storage plants and canneries in the county. Fresh berries are shipped nationwide because of their good keeping qualities. Other fruit produced includes blueberries, strawberries, and apples.

Dairying is also an important farming enterprise in the county. A number of farms retail the milk they produce. Others sell milk wholesale to cooperatives or to local distributors. Operations are well mechanized, and most milk is handled by bulk tank storage and transport. Residential developments are gradually reducing the acreage available for dairying and other farming operations.

Suburban expansion has resulted in an increase in the market for ornamental shrubs, and the number of small shrub nurseries is increasing.

Poultry and poultry products are also important to the economy of the county. There are both large, highly mechanized operations and many small flocks on farms where eggs are sold retail or to local outlets.

Most of the vegetables grown are sold at roadside stands. Sweet corn, snap beans, and squash are the most important vegetable crops.

Farmers in Plymouth County can receive technical assistance from several agencies. In addition to meetings and farm visits, the Co-operative Extension Service carries on an educational program through the newspapers, radio, and television. The Cranberry Experiment Station at Wareham conducts both experimental and educational programs to assist cranberry growers. A frost-warning service is also maintained.

TABLE 12.--ANNUAL FREQUENCIES OF SELECTED TEMPERATURE LEVELS AND AVERAGES OF HEATING AND GROWING DEGREE-DAYS

Station	Mean number of days with--				Accumulated heat units (degree-days)		
	Maximum temperature of--		Minimum temperature of--		Heating	Growing	
	90° F. or higher	32° F. or lower	32° F. or lower	0 or lower	Base 65° F.	Base 40° F.	Base 50° F.
	Days	Days	Days	Days	Degree-days	Degree-days	Degree-days
Brockton	15	20	125	3	5,905	4,890	2,655
East Wareham	4	22	131	4	6,080	4,645	2,480
Plymouth	10	19	110	2	5,575	4,980	2,705
Rochester	6	22	140	5	6,190	4,545	2,390

TABLE 13.--PROBABILITIES OF LAST FREEZING TEMPERATURES IN SPRING AND FIRST IN FALL

Brockton

Probability	Dates for given probability and temperature				
	32° F. or lower	28° F. or lower	24° F. or lower	20° F. or lower	16° F. or lower
Spring:					
1 year in 10 later than	May 27	May 7	April 18	April 10	April 1
2 years in 10 later than	May 21	May 1	April 12	April 4	March 26
5 years in 10 later than	May 11	April 21	April 2	March 25	March 16
8 years in 10 later than	May 1	April 11	March 23	March 15	March 6
Fall:					
1 year in 10 earlier than	September 20	October 1	October 11	November 4	November 15
2 years in 10 earlier than	September 26	October 7	October 17	November 10	November 21
5 years in 10 earlier than	October 5	October 17	October 27	November 20	December 1
8 years in 10 earlier than	October 16	October 27	November 6	November 30	December 11

East Wareham

Spring:					
1 year in 10 later than	May 15	May 3	April 26	April 9	March 24
2 years in 10 later than	May 10	April 28	April 20	April 4	March 19
5 years in 10 later than	May 1	April 19	April 8	March 25	March 9
8 years in 10 later than	April 22	April 10	March 27	March 14	March 1
Fall:					
1 year in 10 earlier than	September 28	October 9	October 17	October 31	November 16
2 years in 10 earlier than	October 2	October 13	October 24	November 6	November 21
5 years in 10 earlier than	October 7	October 21	November 5	November 17	December 1
8 years in 10 earlier than	October 14	October 29	November 17	November 28	December 11

Plymouth

Spring:					
1 year in 10 later than	May 11	April 24	April 13	April 3	March 25
2 years in 10 later than	May 6	April 19	April 8	March 29	March 20
5 years in 10 later than	April 26	April 9	March 29	March 19	March 10
8 years in 10 later than	April 16	March 30	March 19	March 9	February 28
Fall:					
1 year in 10 earlier than	October 2	October 20	November 5	November 15	November 24
2 years in 10 earlier than	October 7	October 25	November 10	November 20	November 29
5 years in 10 earlier than	October 17	November 4	November 20	November 30	December 9
8 years in 10 earlier than	October 27	November 14	November 30	December 10	December 19

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Glossary

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Diversion terraces. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Esker (geology). A narrow, winding ridge or mound of stratified gravelly and sandy drift that was deposited by a subglacial stream.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist. the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur 15 to 40 inches below the surface.

Glacial drift (geology). Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice; the deposits are stratified and occur in the form of kames, eskers, deltas, and outwash plains.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the subsoil or substratum, as a result of poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon. A layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon. The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon. The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has (1) distinctive characteristics caused by accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon. The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum a Roman numeral precedes the letter C.

R layer. Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are these: terminal, lateral, medial, ground.

Parent material (soil). The disintegrated and partly weathered rock from which the soil has formed.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *Very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline.	9.1 and higher

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Weathering, soil. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

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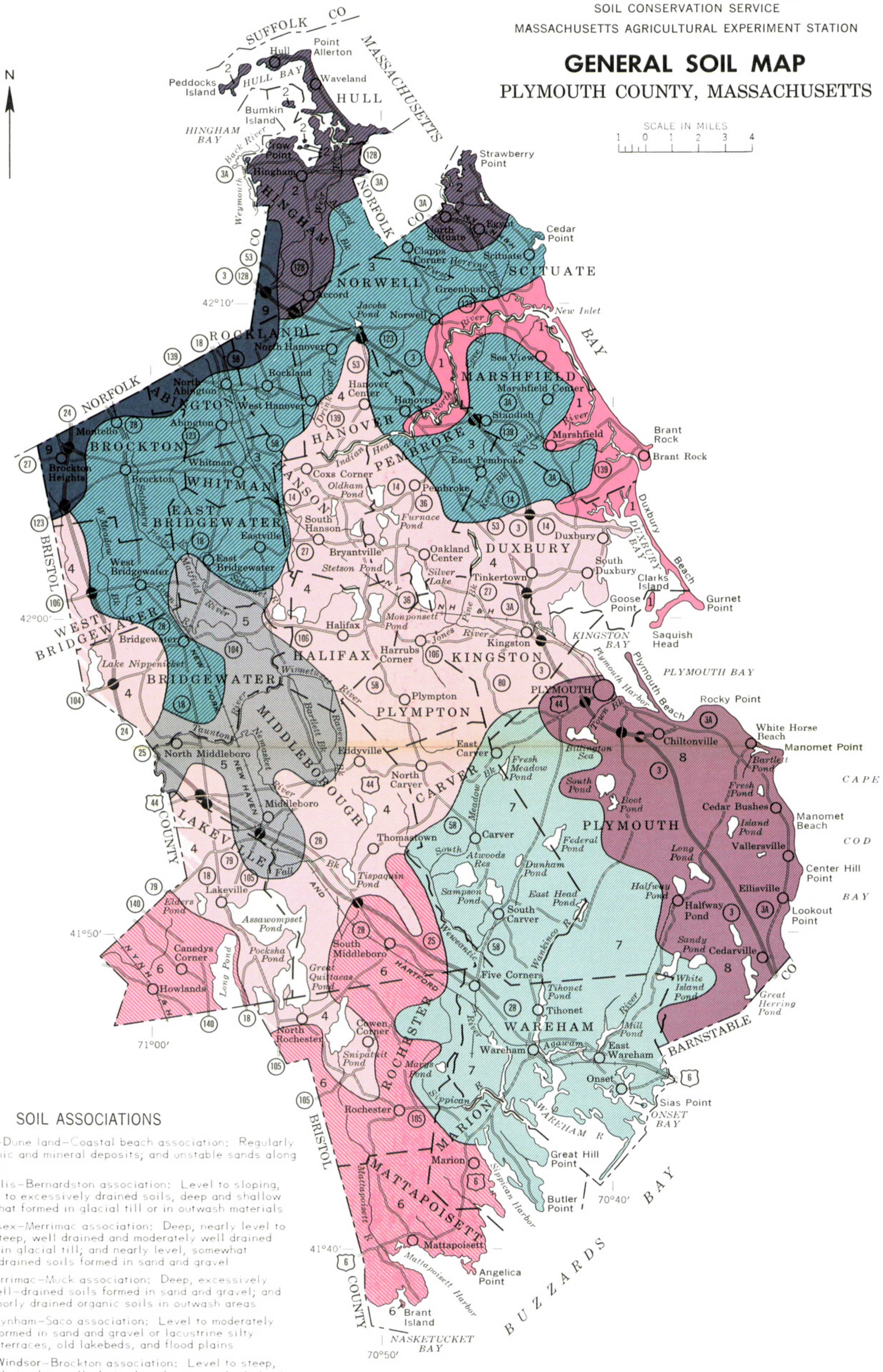
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

PLYMOUTH COUNTY, MASSACHUSETTS



SOIL ASSOCIATIONS

1 — Tidal marsh–Dune land–Coastal beach association: Regularly flooded organic and mineral deposits; and unstable sands along the seashore

2 — Quonset–Hollis–Bernardston association: Level to sloping, well-drained to excessively drained soils, deep and shallow to bedrock, that formed in glacial till or in outwash materials

3 — Scituate–Essex–Merrimac association: Deep, nearly level to moderately steep, well drained and moderately well drained soils formed in glacial till; and nearly level, somewhat excessively drained soils formed in sand and gravel

4 — Hinckley–Merrimac–Muck association: Deep, excessively drained to well-drained soils formed in sand and gravel; and deep, very poorly drained organic soils in outwash areas

5 — Merrimac–Raynham–Saco association: Level to moderately steep soils formed in sand and gravel or lacustrine silty materials on terraces, old lakebeds, and flood plains

6 — Gloucester–Windsor–Brockton association: Level to steep, excessively drained to well-drained, and very poorly drained soils formed in glacial till or outwash materials

7 — Carver–Peat association: Nearly level to steep, excessively drained soils formed in deep outwash sands; and very poorly drained organic soils in low areas

8 — Carver–Gloucester association: Level to steep, excessively drained and somewhat excessively drained soils formed in deep sand and glacial till on outwash plains and ground moraines

9 — Hollis–Charlton–Essex–Muck association: Rolling, somewhat excessively drained and well-drained soils, deep and shallow to bedrock, that formed in glacial till; and level, very poorly drained organic soils

July 1968

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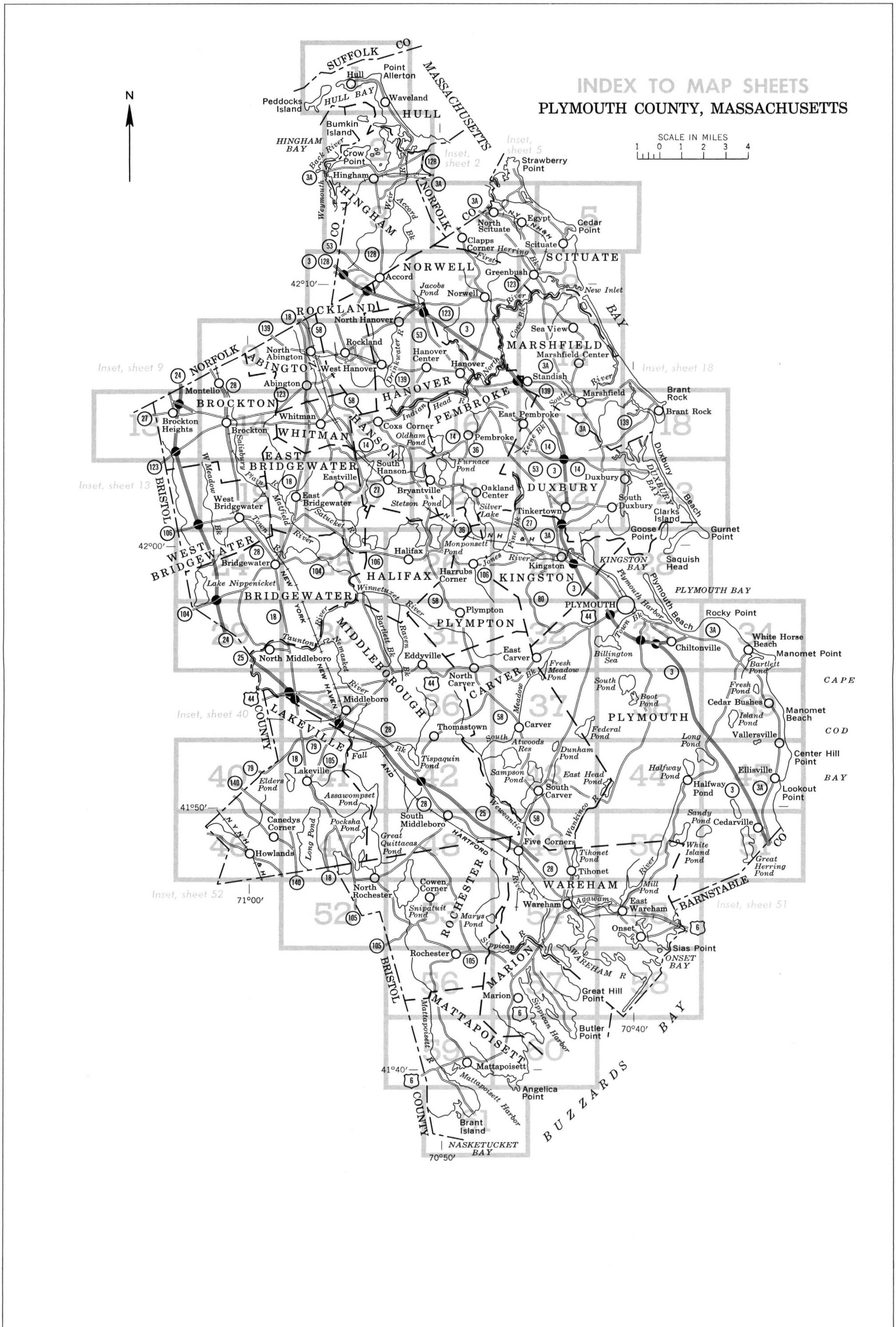
PLYMOUTH COUNTY, MASSACHUSETTS



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Symbols without a slope letter are those of nearly level soils or land types.

SYMBOL	NAME
AfA	Agawam fine sandy loam, 0 to 3 percent slopes
AfB	Agawam fine sandy loam, 3 to 8 percent slopes
AgA	Agawam fine sandy loam, silty subsoil variant, 0 to 3 percent slopes
AgB	Agawam fine sandy loam, silty subsoil variant, 3 to 8 percent slopes
AuA	Au Gres and Wareham loamy sands, 0 to 3 percent slopes
AuB	Au Gres and Wareham loamy sands, 3 to 8 percent slopes
BaA	Belgrade silt loam, 0 to 3 percent slopes
BaB	Belgrade silt loam, 3 to 8 percent slopes
BbB	Bernardston silt loam, 3 to 8 percent slopes
BbC	Bernardston silt loam, 8 to 15 percent slopes
BcB	Bernardston very stony silt loam, 3 to 8 percent slopes
BcD	Bernardston very stony silt loam, 8 to 25 percent slopes
BdA	Birdsall silt loam, 0 to 3 percent slopes
Bo	Borrow land, loamy material
Br	Borrow land, sandy and gravelly materials
BsA	Brockton loam, 0 to 3 percent slopes
BtA	Brockton extremely stony loam, 0 to 3 percent slopes
CaA	Carver coarse sand, 0 to 3 percent slopes
CaB	Carver coarse sand, 3 to 8 percent slopes
CaC	Carver coarse sand, 8 to 15 percent slopes
CaE	Carver coarse sand, 15 to 35 percent slopes
CbA	Carver loamy coarse sand, 0 to 3 percent slopes
CbB	Carver loamy coarse sand, 3 to 8 percent slopes
CbC	Carver loamy coarse sand, 8 to 15 percent slopes
CcD	Carver and Gloucester soils, 8 to 35 percent slopes
DeA	Deerfield sandy loam, 0 to 3 percent slopes
DeB	Deerfield sandy loam, 3 to 8 percent slopes
Du	Dune land and Coastal beach
EnA	Enfield very fine sandy loam, 0 to 3 percent slopes
EnB	Enfield very fine sandy loam, 3 to 8 percent slopes
EnC	Enfield very fine sandy loam, 8 to 15 percent slopes
EsA	Essex coarse sandy loam, 0 to 3 percent slopes
EsB	Essex coarse sandy loam, 3 to 8 percent slopes
EsC	Essex coarse sandy loam, 8 to 15 percent slopes
EtB	Essex very stony coarse sandy loam, 3 to 8 percent slopes
EtC	Essex very stony coarse sandy loam, 8 to 15 percent slopes
EtD	Essex very stony coarse sandy loam, 15 to 25 percent slopes
EuB	Essex extremely stony coarse sandy loam, 3 to 8 percent slopes
EuC	Essex extremely stony coarse sandy loam, 8 to 25 percent slopes
Fr	Fresh water marsh
GaA	Gloucester fine sandy loam, firm substratum, 0 to 3 percent slopes
GaB	Gloucester fine sandy loam, firm substratum, 3 to 8 percent slopes
GaC	Gloucester fine sandy loam, firm substratum, 8 to 15 percent slopes
GbA	Gloucester loamy sand, 0 to 3 percent slopes
GbB	Gloucester loamy sand, 3 to 8 percent slopes
GbC	Gloucester loamy sand, 8 to 15 percent slopes
GcB	Gloucester very stony fine sandy loam, firm substratum, 3 to 8 percent slopes
GcC	Gloucester very stony fine sandy loam, firm substratum, 8 to 15 percent slopes
GcD	Gloucester very stony fine sandy loam, firm substratum, 15 to 25 percent slopes
GdB	Gloucester very stony loamy sand, 3 to 8 percent slopes
GdC	Gloucester very stony loamy sand, 8 to 15 percent slopes
GeB	Gloucester extremely stony loamy sand, 3 to 15 percent slopes
GeD	Gloucester extremely stony loamy sand, 15 to 35 percent slopes
HaA	Hinckley gravelly loamy sand, 0 to 3 percent slopes
HaB	Hinckley gravelly loamy sand, 3 to 8 percent slopes
HaC	Hinckley gravelly loamy sand, 8 to 15 percent slopes
HaE	Hinckley gravelly loamy sand, 15 to 35 percent slopes
HoB	Hollis–Charlton fine sandy loams, 3 to 8 percent slopes
HpC	Hollis–Charlton very rocky fine sandy loams, 3 to 15 percent slopes
HrC	Hollis–Charlton extremely rocky fine sandy loams, 3 to 15 percent slopes
HrD	Hollis–Charlton extremely rocky fine sandy loams, 15 to 25 percent slopes
Ma	Made land
MeA	Merrimac fine sandy loam, 0 to 3 percent slopes
MeB	Merrimac fine sandy loam, 3 to 8 percent slopes
MeC	Merrimac fine sandy loam, 8 to 15 percent slopes
MfA	Merrimac sandy loam, 0 to 3 percent slopes
MfB	Merrimac sandy loam, 3 to 8 percent slopes
MfC	Merrimac sandy loam, 8 to 15 percent slopes
MfE	Merrimac sandy loam, 15 to 35 percent slopes
Mu	Muck, shallow
Mv	Muck, deep
NnA	Ninigret sandy loam, silty subsoil variant, 0 to 3 percent slopes
NnB	Ninigret sandy loam, silty subsoil variant, 3 to 8 percent slopes
NoA	Norwell sandy loam, 0 to 3 percent slopes
NoB	Norwell sandy loam, 3 to 8 percent slopes
NpA	Norwell extremely stony sandy loam, 0 to 3 percent slopes
NpB	Norwell extremely stony sandy loam, 3 to 8 percent slopes
Pe	Peat
PtA	Pittstown silt loam, 0 to 8 percent slopes
PuB	Pittstown very stony silt loam, 3 to 15 percent slopes
QuA	Quonset sandy loam, 0 to 3 percent slopes
QuB	Quonset sandy loam, 3 to 8 percent slopes
QuC	Quonset sandy loam, 8 to 15 percent slopes
QuE	Quonset sandy loam, 15 to 35 percent slopes
RaA	Raynham silt loam, 0 to 3 percent slopes
Sa	Saco very fine sandy loam
Sb	Sanded muck
ScA	Scarboro sandy loam, 0 to 3 percent slopes
SdA	Scarboro fine sandy loam, silty subsoil variant, 0 to 3 percent slopes
SeA	Scituate sandy loam, 0 to 3 percent slopes
SeB	Scituate sandy loam, 3 to 8 percent slopes
SfA	Scituate very stony sandy loam, 0 to 3 percent slopes
SfB	Scituate very stony sandy loam, 3 to 8 percent slopes
SgA	Scituate extremely stony sandy loam, 0 to 3 percent slopes
SgB	Scituate extremely stony sandy loam, 3 to 8 percent slopes
Td	Tidal marsh
TsA	Tisbury very fine sandy loam, 0 to 8 percent slopes
WaA	Walpole fine sandy loam, silty subsoil variant, 0 to 3 percent slopes
WbA	Warwick fine sandy loam, 0 to 3 percent slopes
WbB	Warwick fine sandy loam, 3 to 8 percent slopes
WbC	Warwick fine sandy loam, 8 to 15 percent slopes
WcC	Warwick very rocky fine sandy loam, 3 to 15 percent slopes
WnA	Windsor loamy sand, 0 to 3 percent slopes
WnB	Windsor loamy sand, 3 to 8 percent slopes
WnC	Windsor loamy sand, 8 to 15 percent slopes
WnE	Windsor loamy sand, 15 to 35 percent slopes

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mines and Quarries
- Mine dump
- Pits, gravel or other

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches — CANAL

Lakes and ponds
- Perennial — water, w
- Intermittent

Wells, water — flowing

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stony, very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

Soil map constructed 1968 by Cartographic Division, Soil Conservation Service, USDA, from 1952 and 1964 aerial photographs. Controlled mosaic based on Massachusetts plane coordinate system, mainland zone, Lambert conformal conic projection, 1927 North American datum.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the m

Estimated yields, table 1, page 18.
Community development, table 2, page 21.
Engineering uses of the soils, tables 3, 4, and 5, pages 30 through 57.

Potential for woodland, tabl
Wildlife, table 8, page 66.
Acreage and extent, table 9,

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page
AfA	Agawam fine sandy loam, 0 to 3 percent slopes	74	I-5	8
AfB	Agawam fine sandy loam, 3 to 8 percent slopes	74	IIe-5	9
AgA	Agawam fine sandy loam, silty subsoil variant, 0 to 3 percent slopes	74	I-5	8
AgB	Agawam fine sandy loam, silty subsoil variant, 3 to 8 percent slopes	74	IIe-5	9
AuA	Au Gres and Wareham loamy sands, 0 to 3 percent slopes	74	IVw-9	13
AuB	Au Gres and Wareham loamy sands, 3 to 8 percent slopes	74	IVw-9	13
BaA	Belgrade silt loam, 0 to 3 percent slopes	75	IIw-4	10
BaB	Belgrade silt loam, 3 to 8 percent slopes	75	IIw-4	10
BbB	Bernardston silt loam, 3 to 8 percent slopes	75	IIe-2	8
BbC	Bernardston silt loam, 8 to 15 percent slopes	75	IIIe-2	11
BcB	Bernardston very stony silt loam, 3 to 8 percent slopes	75	VIs-2	14
BcD	Bernardston very stony silt loam, 8 to 25 percent slopes	75	VIs-2	14
BdA	Birdsall silt loam, 0 to 3 percent slopes	76	VIw-4	14
Bo	Borrow land, loamy material	76	-------	--
Br	Borrow land, sandy and gravelly materials	76	-------	--
BsA	Brockton loam, 0 to 3 percent slopes	76	Vw-2	13
BtA	Brockton extremely stony loam, 0 to 3 percent slopes	76	VIIs-24	16
CaA	Carver coarse sand, 0 to 3 percent slopes	77	VIIs-9	15
CaB	Carver coarse sand, 3 to 8 percent slopes	77	VIIs-9	15
CaC	Carver coarse sand, 8 to 15 percent slopes	77	VIIs-9	15
CaE	Carver coarse sand, 15 to 35 percent slopes	77	VIIs-9	15
CbA	Carver loamy coarse sand, 0 to 3 percent slopes	77	IVs-9	13
CbB	Carver loamy coarse sand, 3 to 8 percent slopes	77	IVs-9	13
CbC	Carver loamy coarse sand, 8 to 15 percent slopes	77	VIIs-9	15
CcD	Carver and Gloucester soils, 8 to 35 percent slopes	77	VIIs-9	15
DeA	Deerfield sandy loam, 0 to 3 percent slopes	78	IIIw-9	12
DeB	Deerfield sandy loam, 3 to 8 percent slopes	78	IIIw-9	12
Du	Dune land and Coastal beach	78	VIIIs-2	16
EnA	Enfield very fine sandy loam, 0 to 3 percent slopes	78	I-5	8
EnB	Enfield very fine sandy loam, 3 to 8 percent slopes	78	IIe-5	9
EnC	Enfield very fine sandy loam, 8 to 15 percent slopes	79	IIIe-5	11
EsA	Essex coarse sandy loam, 0 to 3 percent slopes	79	I-2	8
EsB	Essex coarse sandy loam, 3 to 8 percent slopes	79	IIe-2	8
EsC	Essex coarse sandy loam, 8 to 15 percent slopes	79	IIIe-2	11
EtB	Essex very stony coarse sandy loam, 3 to 8 percent slopes	79	VIs-2	14
EtC	Essex very stony coarse sandy loam, 8 to 15 percent slopes	79	VIs-2	14
EtD	Essex very stony coarse sandy loam, 15 to 25 percent slopes	79	VIs-2	14
EuB	Essex extremely stony coarse sandy loam, 3 to 8 percent slopes	79	VIIs-2	14
EuC	Essex extremely stony coarse sandy loam, 8 to 25 percent slopes	80	VIIs-2	14
Fr	Fresh water marsh	80	VIIIw-1	16
GaA	Gloucester fine sandy loam, firm substratum, 0 to 3 percent slopes	80	I-3	8
GaB	Gloucester fine sandy loam, firm substratum, 3 to 8 percent slopes	80	IIe-3	8
GaC	Gloucester fine sandy loam, firm substratum, 8 to 15 percent slopes	80	IIIe-3	11
GbA	Gloucester loamy sand, 0 to 3 percent slopes	80	IIIs-9	12
GbB	Gloucester loamy sand, 3 to 8 percent slopes	80	IIIs-9	12
GbC	Gloucester loamy sand, 8 to 15 percent slopes	80	IVs-9	13
GcB	Gloucester very stony fine sandy loam, firm substratum, 3 to 8 percent slopes	80	VIs-8	14
GcC	Gloucester very stony fine sandy loam, firm substratum, 8 to 15 percent slopes	81	VIs-8	14
GcD	Gloucester very stony fine sandy loam, firm substratum, 15 to 25 percent slopes	81	VIs-8	14
GdB	Gloucester very stony loamy sand, 3 to 8 percent slopes	81	VIs-8	14
GdC	Gloucester very stony loamy sand, 8 to 15 percent slopes	81	VIs-8	14
GeB	Gloucester extremely stony loamy sand, 3 to 15 percent slopes	81	VIIs-2	14

Map symbol	
GeD	Gloucester extreme
HaA	Hinckley gravelly
HaB	Hinckley gravelly
HaC	Hinckley gravelly
HaE	Hinckley gravelly
HoB	Hollis-Charlton fi
HpC	Hollis-Charlton ve
HrC	Hollis-Charlton ex
HrD	Hollis-Charlton ex slopes
Ma	Made land
MeA	Merrimac fine sand
MeB	Merrimac fine sand
MeC	Merrimac fine sand
MfA	Merrimac sandy loa
MfB	Merrimac sandy loa
MfC	Merrimac sandy loa
MfE	Merrimac sandy loa
Mu	Muck, shallow
Mv	Muck, deep
NnA	Ninigret sandy loa
NnB	Ninigret sandy loa
NoA	Norwell sandy loam
NoB	Norwell sandy loam
NpA	Norwell extremely
NpB	Norwell extremely
Pe	Peat
PtA	Pittstown silt loa
PuB	Pittstown very sto
QuA	Quonset sandy loam
QuB	Quonset sandy loam
QuC	Quonset sandy loam
QuE	Quonset sandy loam
RaA	Raynham silt loam,
Sa	Saco very fine sar
Sb	Sanded muck
ScA	Scarboro sandy loa
SdA	Scarboro fine sand
SeA	Scituate sandy loa
SeB	Scituate sandy loa
SfA	Scituate very stor
SfB	Scituate very stor
SgA	Scituate extremely
SgB	Scituate extremely
Td	Tidal marsh
TsA	Tisbury very fine
WaA	Walpole fine sandy
WbA	Warwick fine sandy
WbB	Warwick fine sandy
WbC	Warwick fine sandy
WcC	Warwick very rocky
WnA	Windsor loamy sand
WnB	Windsor loamy sand
WnC	Windsor loamy sand
WnE	Windsor loamy sand

309-663 O - 69 (Face O.P. Litho Maps) No. 1

1

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 2)

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 1

(10)

(Joins sheet 6)

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 15)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 10

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(11)

(Joins sheet 7)

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 16)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 11

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

12

(Joins sheet 8)

(Joins sheet 11)

(Joins inset, sheet 18)

(Joins sheet 17)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 12

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

13

(Joins lower right)

(Joins sheet 19)

(Joins sheet 24)

(Joins inset, sheet 9)

(Joins sheet 14)

(Joins upper left)

N

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 13

(14)

(Joins sheet 9)

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 19)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 14

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 10)

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 20)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 15

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 11)

(Joins sheet 15)

(Joins sheet 17)

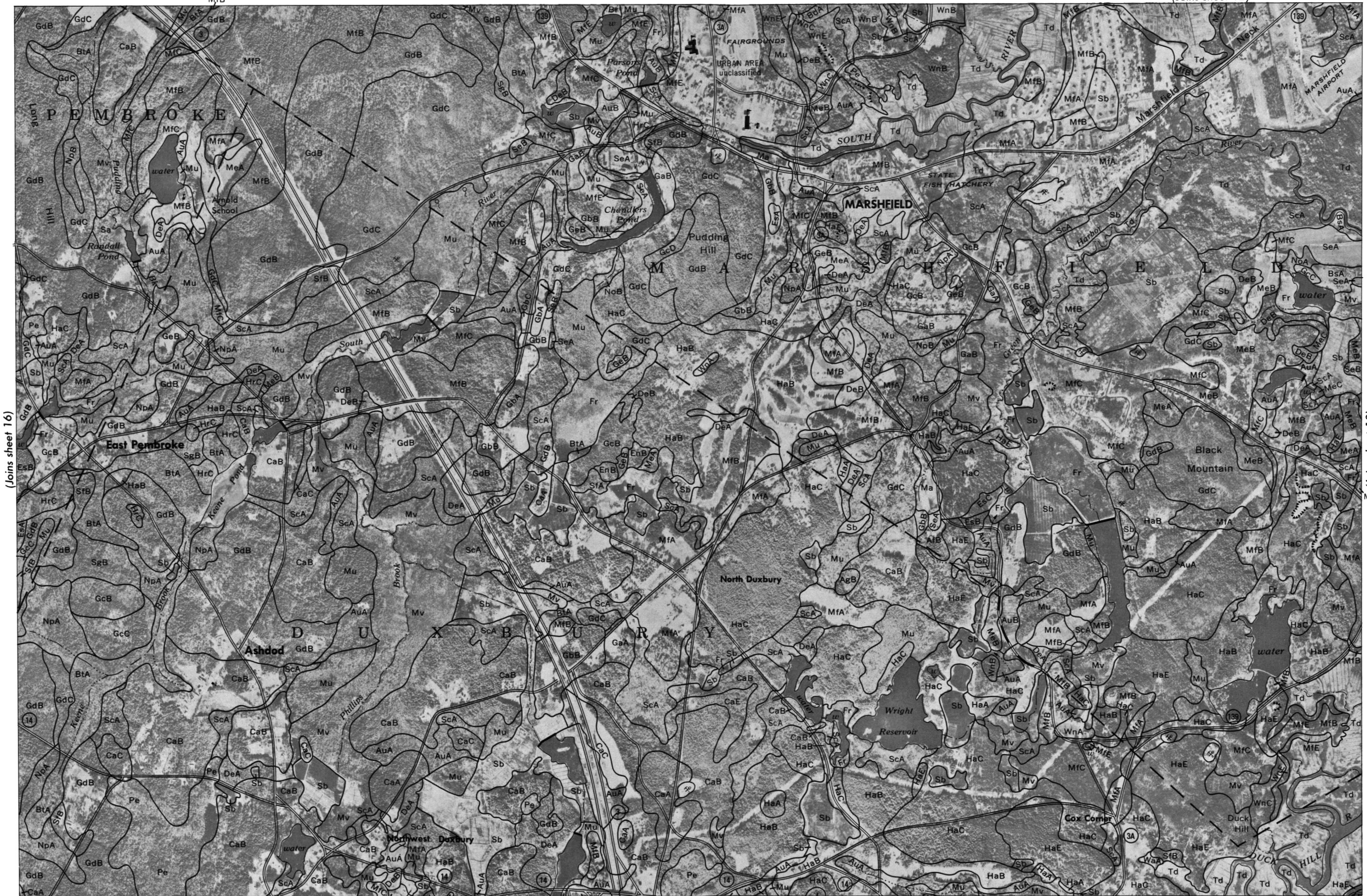
(Joins sheet 21)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 16

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

17



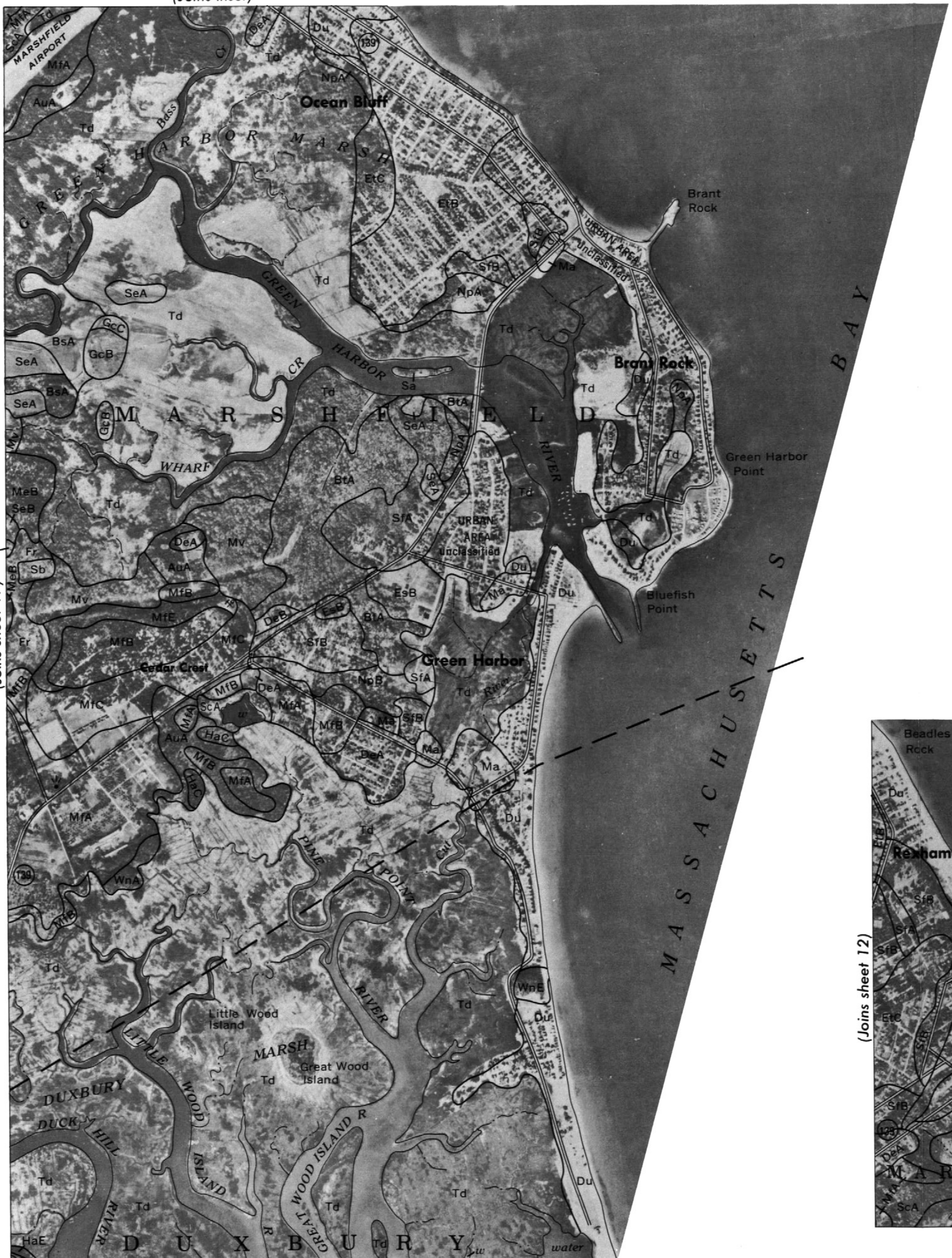
Scale 1:20 000 — 0, ½, 1 Mile — 0, 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 17

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

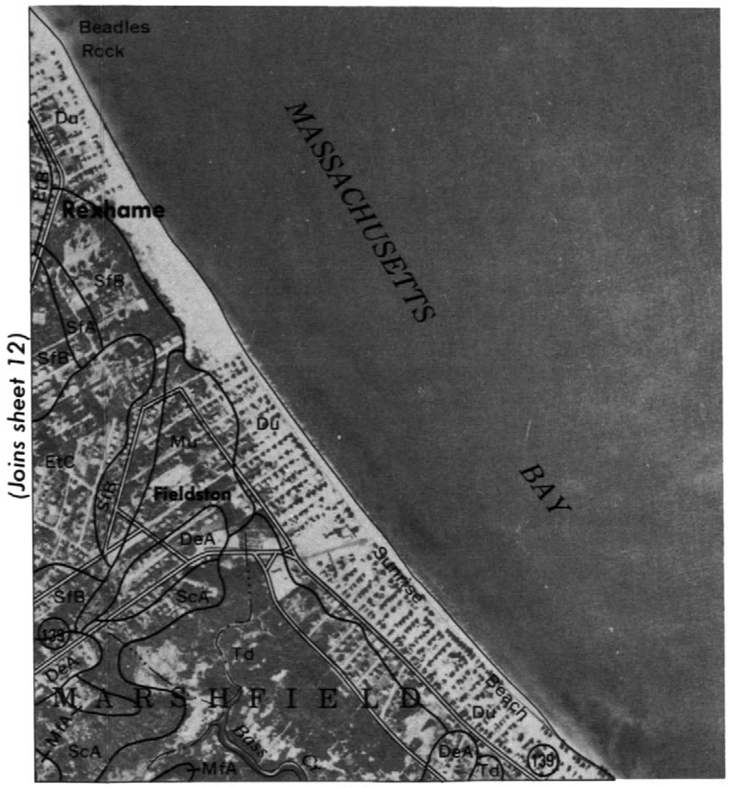
(Joins inset)

N



(Joins sheet 17)

(Joins sheet 23)



(Joins sheet 12)

(Joins upper left)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 18

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 14)

19

N

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 19

(Joins inset, sheet 13)

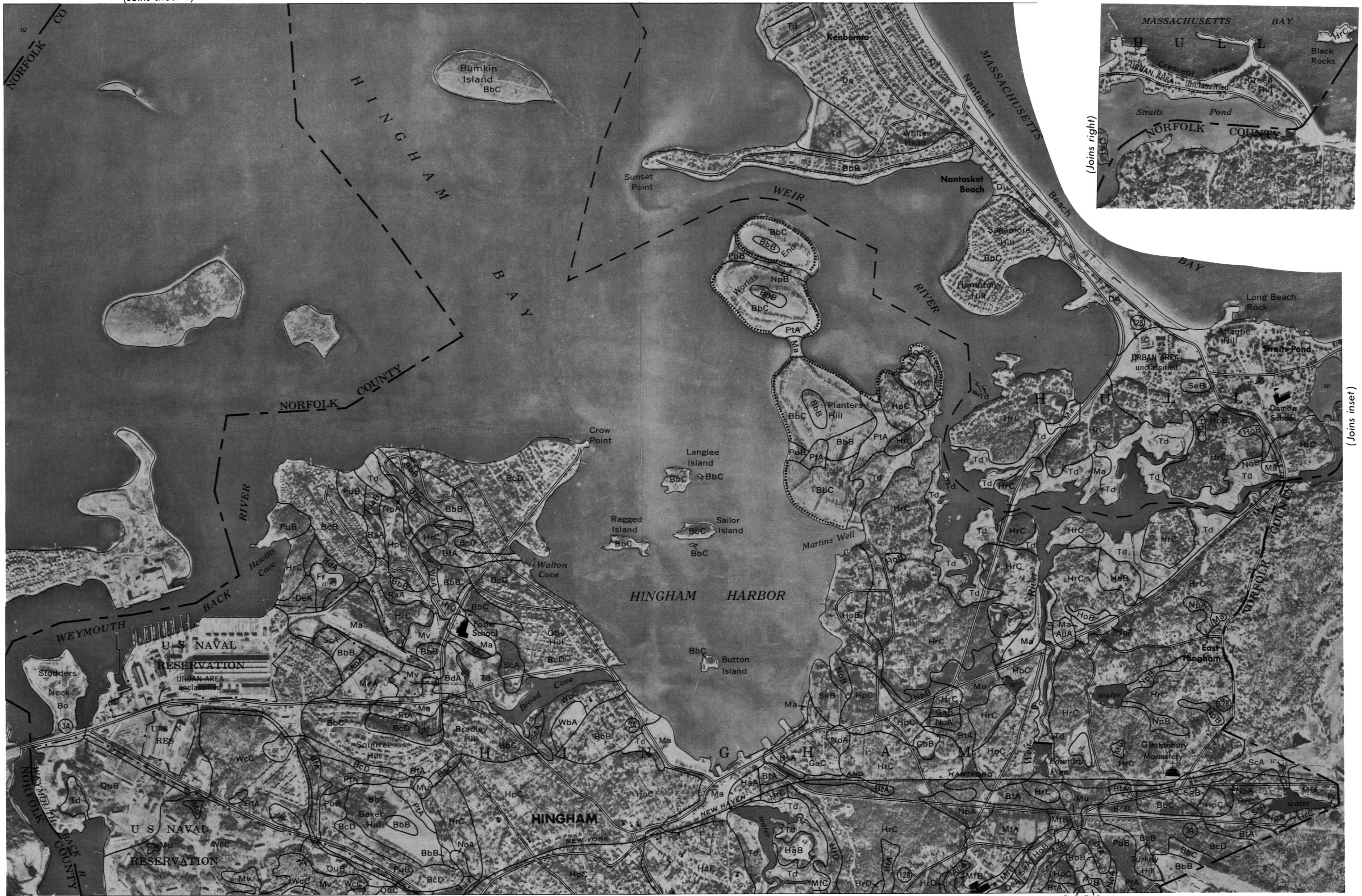
(Joins sheet 20)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 24) | (Joins sheet 25)

2

(Joins sheet 1)



(Joins inset)

(Joins sheet 3)

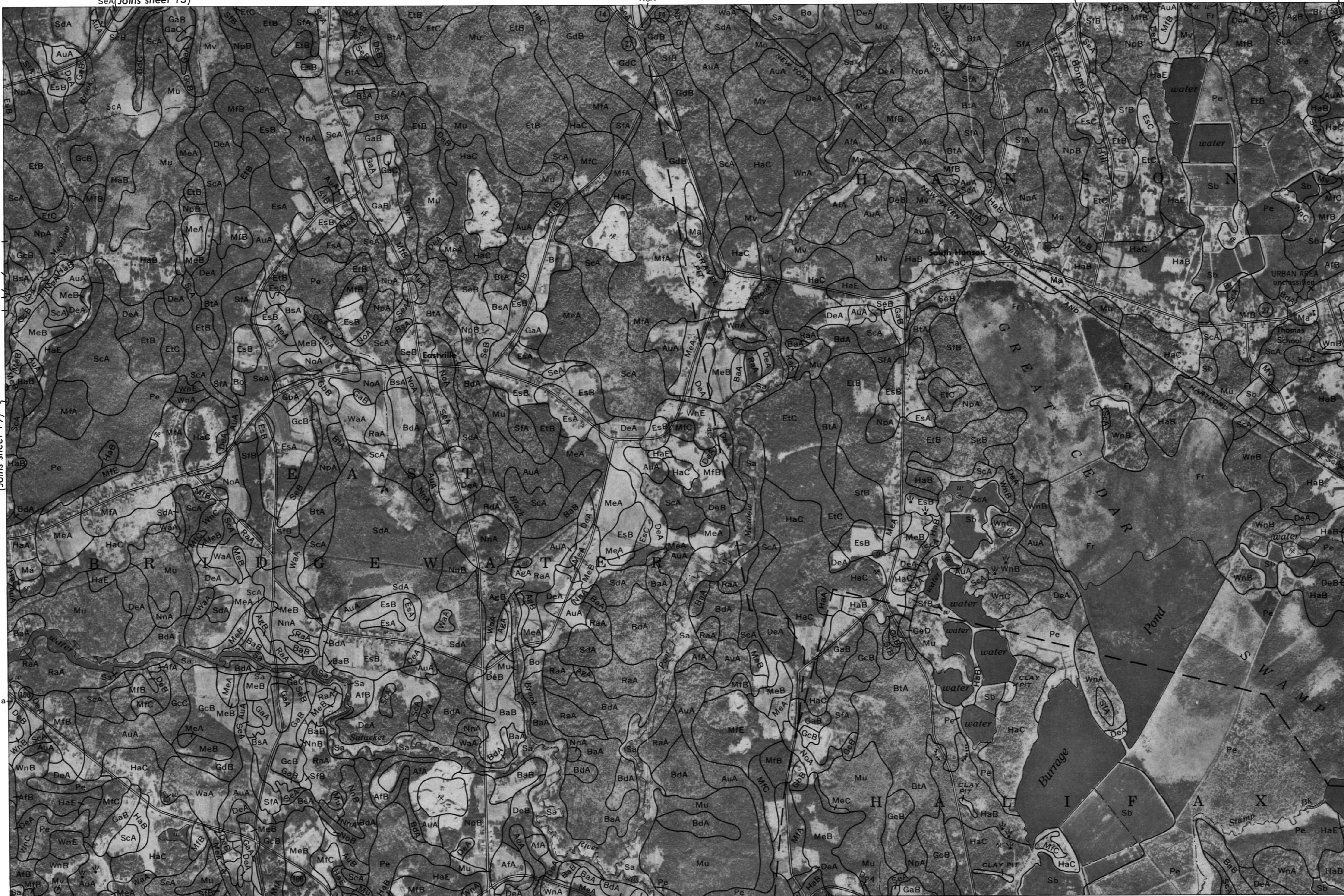
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 2

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

20

(Joins sheet 15)



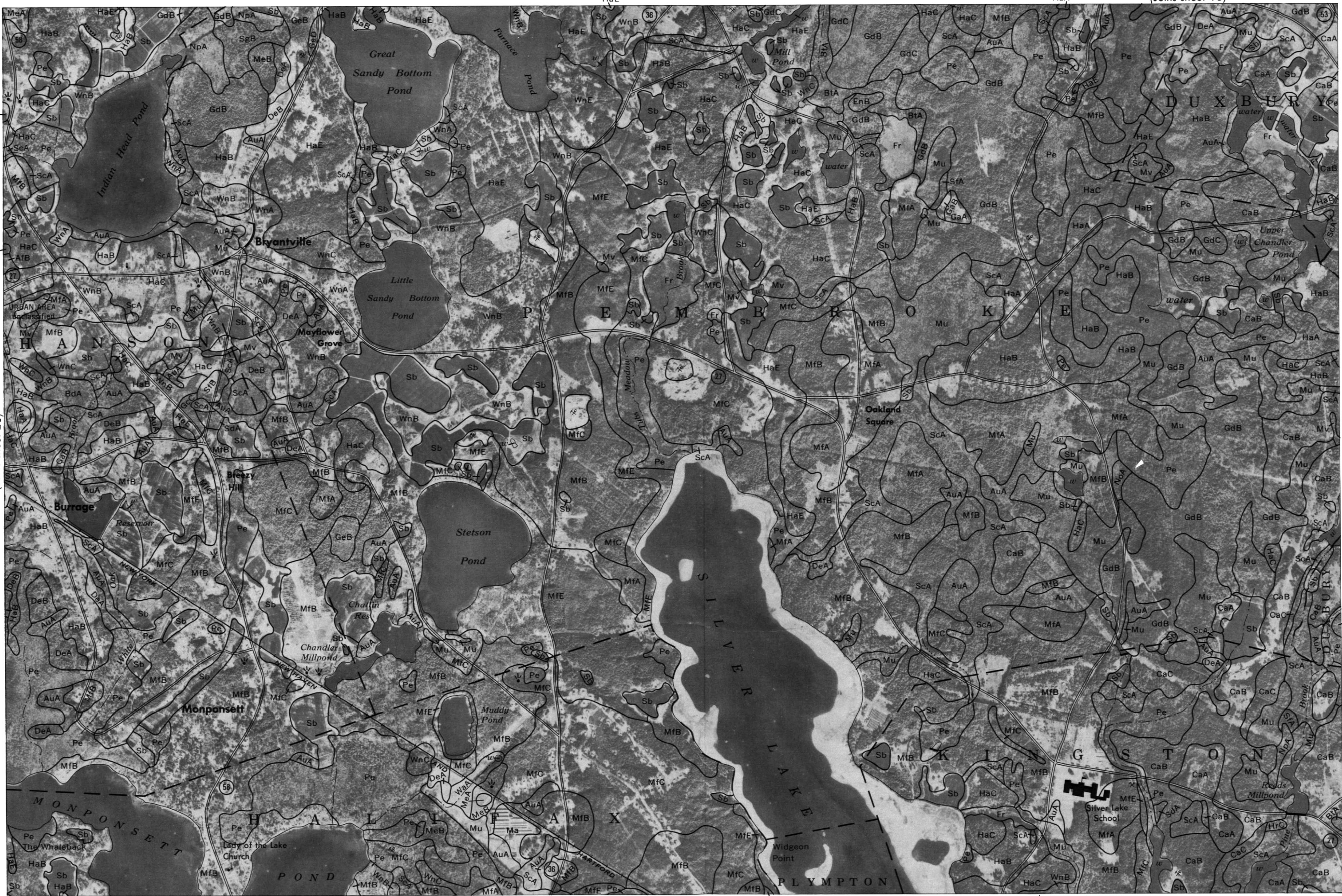
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 25) | (Joins sheet 26)

PLYMOUTH COUNTY, MASSACHUSETTS NO. 20

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 16)



(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 26) | (Joins sheet 27)

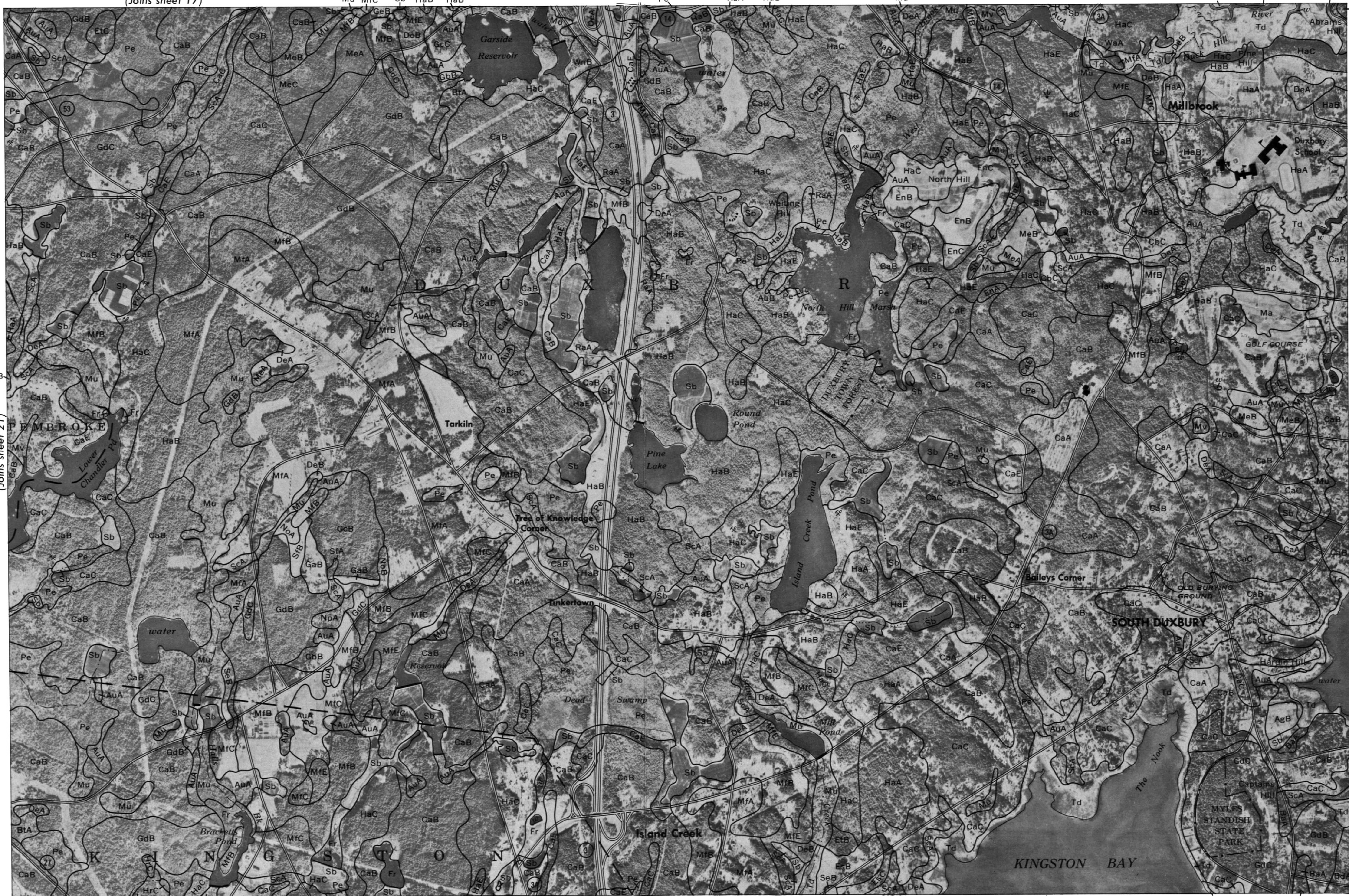
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 21

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

22

(Joins sheet 17)



(Joins sheet 21)

(Joins sheet 23)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

(Joins sheet 27) | (Joins sheet 28)

PLYMOUTH COUNTY, MASSACHUSETTS NO. 22

(Joins sheet 18)

(Joins sheet 22)

(Joins sheet 28)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS — SHEET NUMBER 24

(Joins sheet 13) | (Joins sheet 19)

(Joins sheet 25)

(Joins sheet 29)

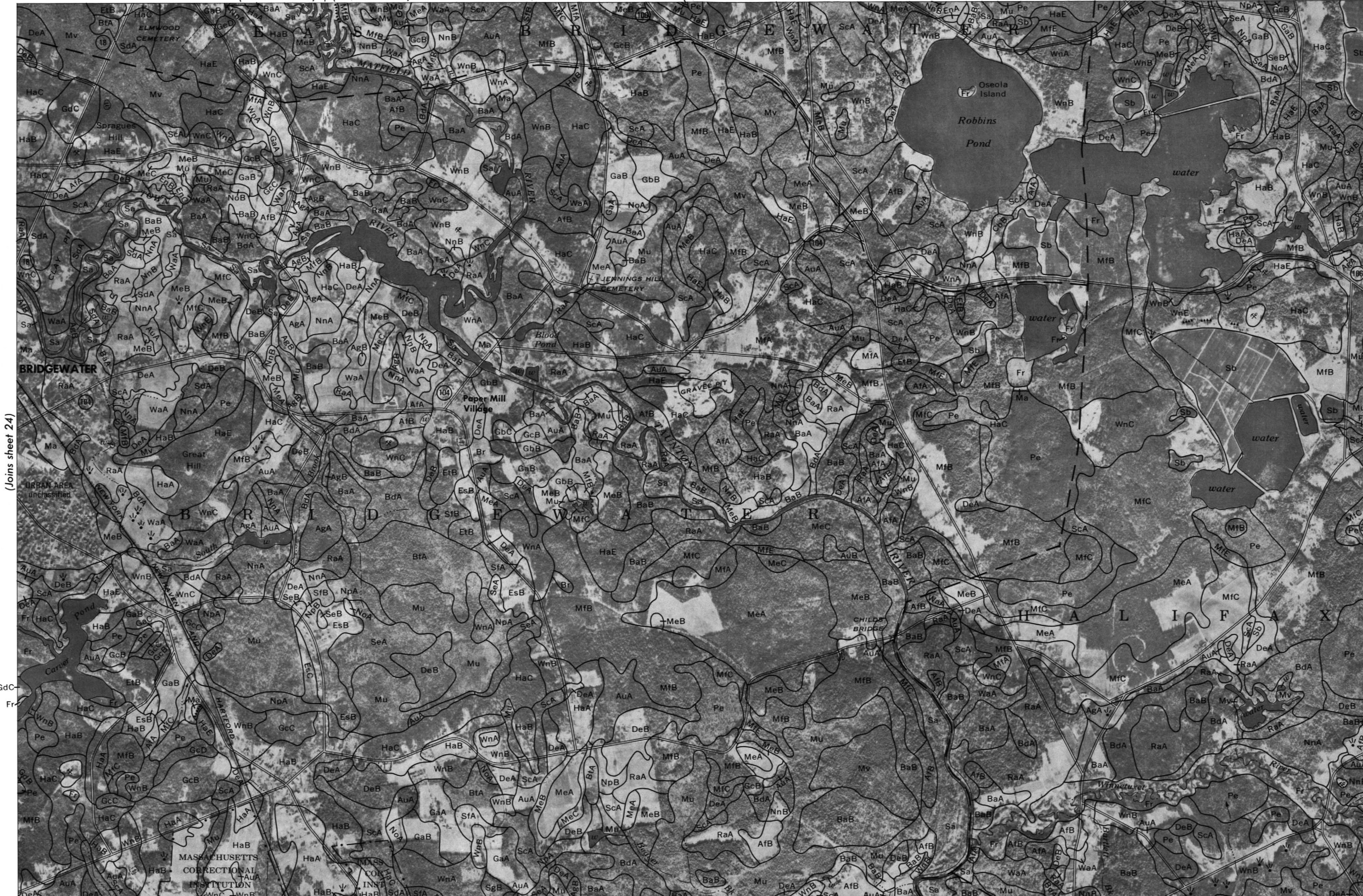
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 24

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

25

(Joins sheet 19) | (Joins sheet 20)



(Joins sheet 24)

(Joins sheet 26)

(Joins sheet 30)

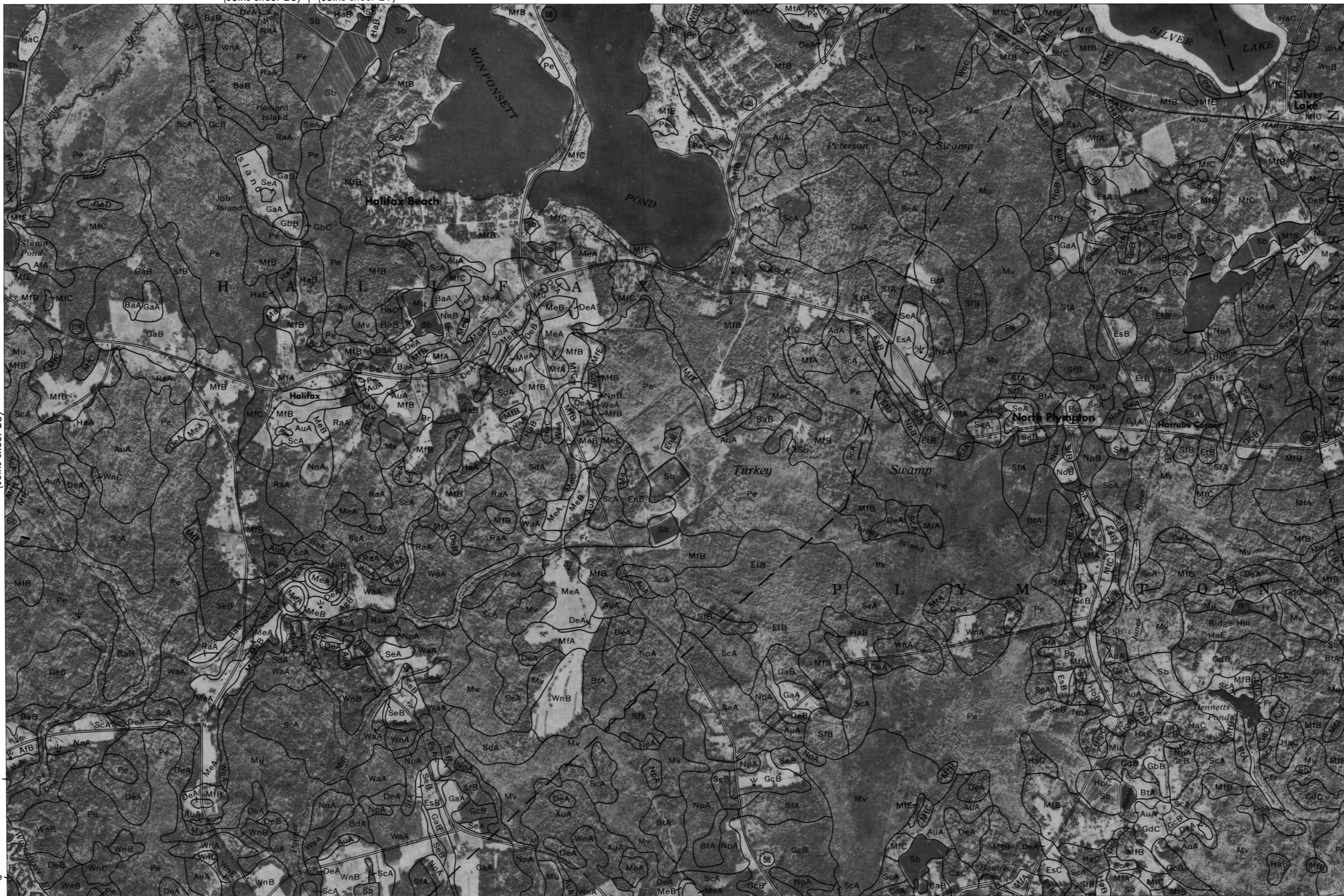
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

26

(Joins sheet 20) | (Joins sheet 21)

(Joins sheet 25)

(Joins sheet 27)



(Joins sheet 31)

Scale 1:20 000

0 ½ 1 Mile

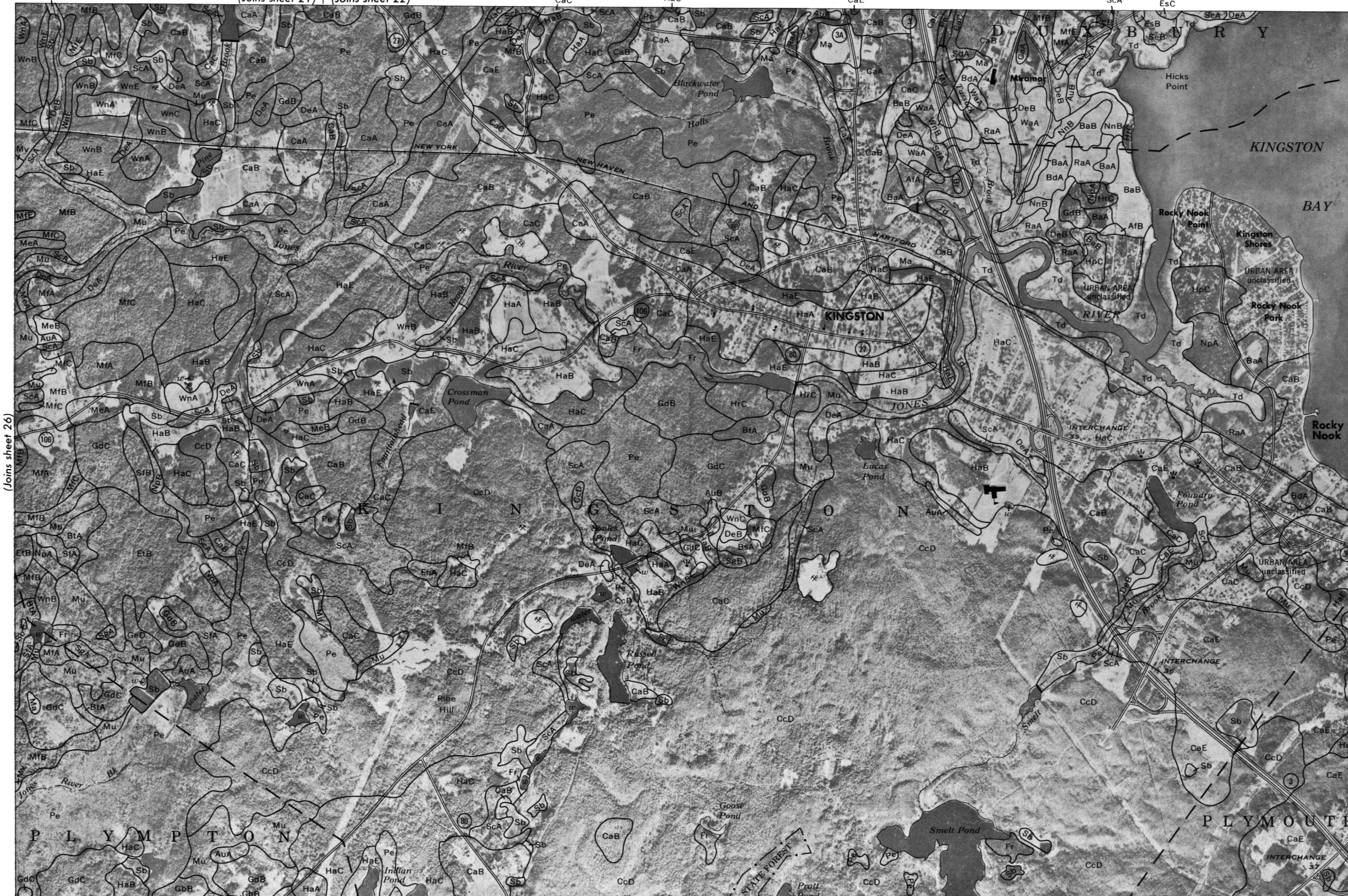
0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 26

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 21) | (Joins sheet 22)

27



(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 32)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 27

28

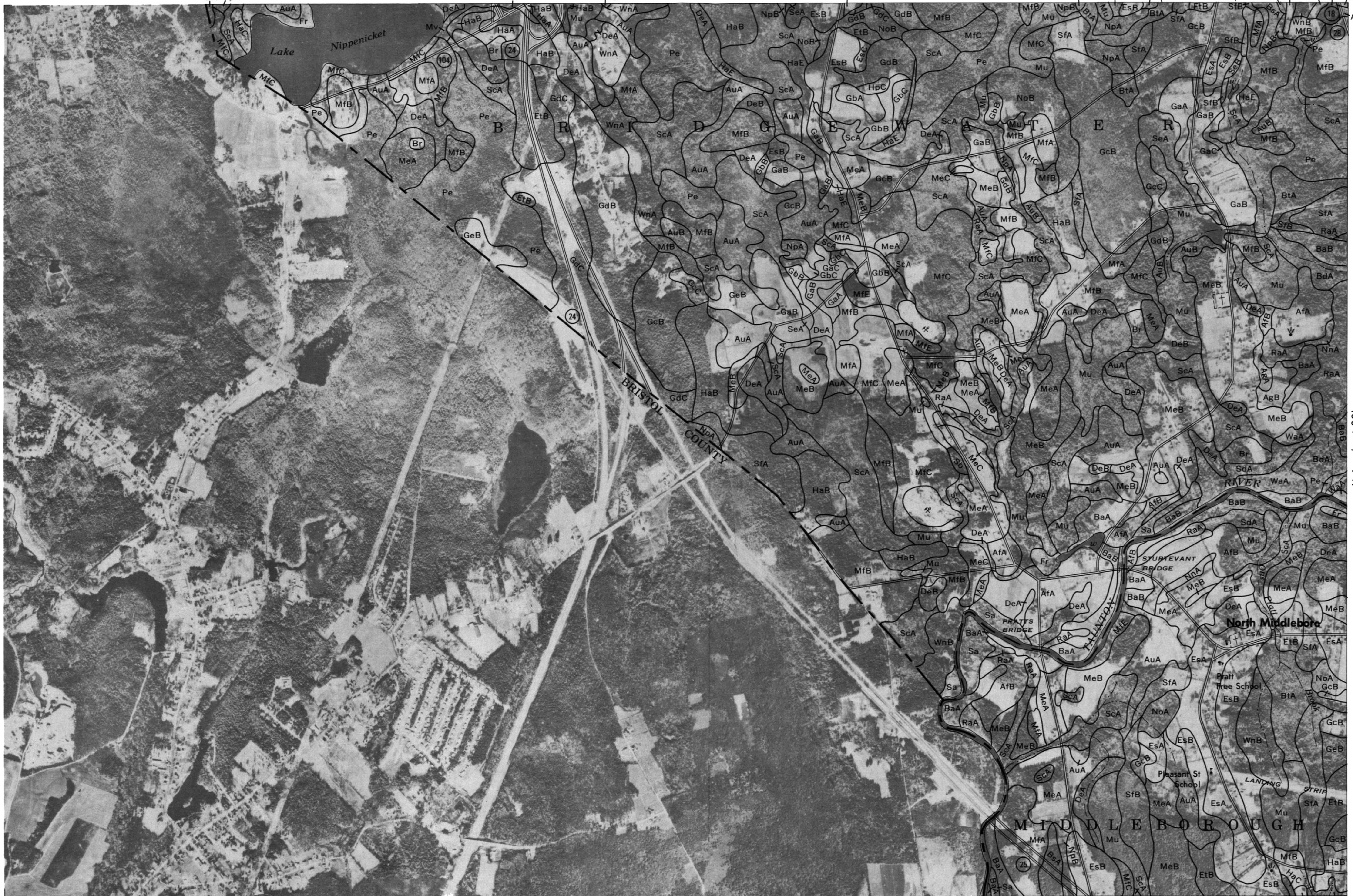
(Joins sheet 22) | (Joins sheet 23)

(Joins sheet 27)

(Joins sheet 33)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 24)



(Joins sheet 30)

(Joins sheet 40)

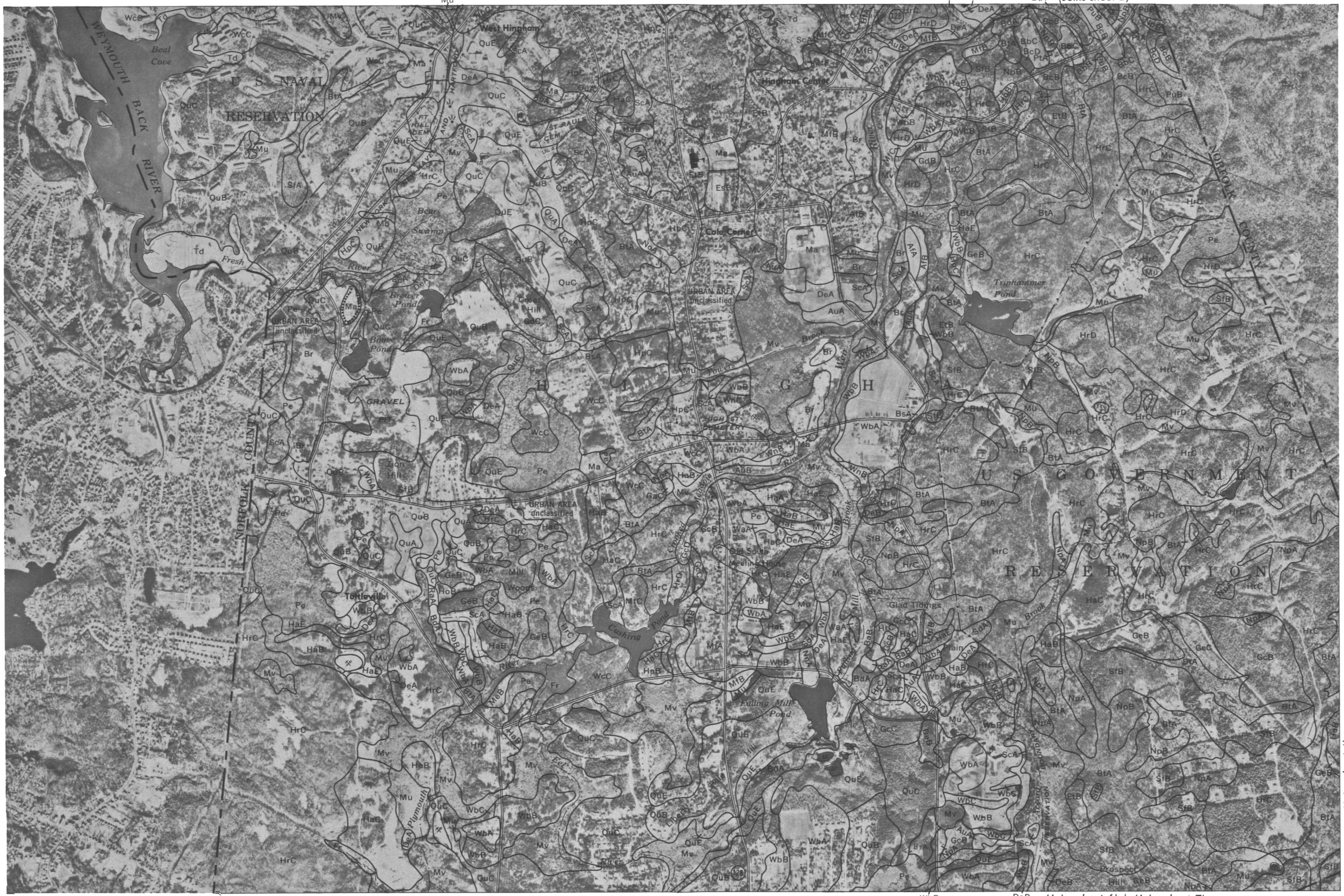
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 29

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

3

(Joins sheet 2)



(Joins sheet 4)

(Joins sheet 6) | (Joins sheet 7)

N

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 3

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 30

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

31

(Joins sheet 26)

(Joins sheet 30)

(Joins sheet 32)

(Joins sheet 36)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 31

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 32
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

33

(Joins sheet 28)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 38)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 39)

Scale 1:20 000 — 0 ½ 1 Mile — 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 34

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 30)

35

PLYMOUTH COUNTY, MASSACHUSETTS NO. 35

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins inset, sheet 40)

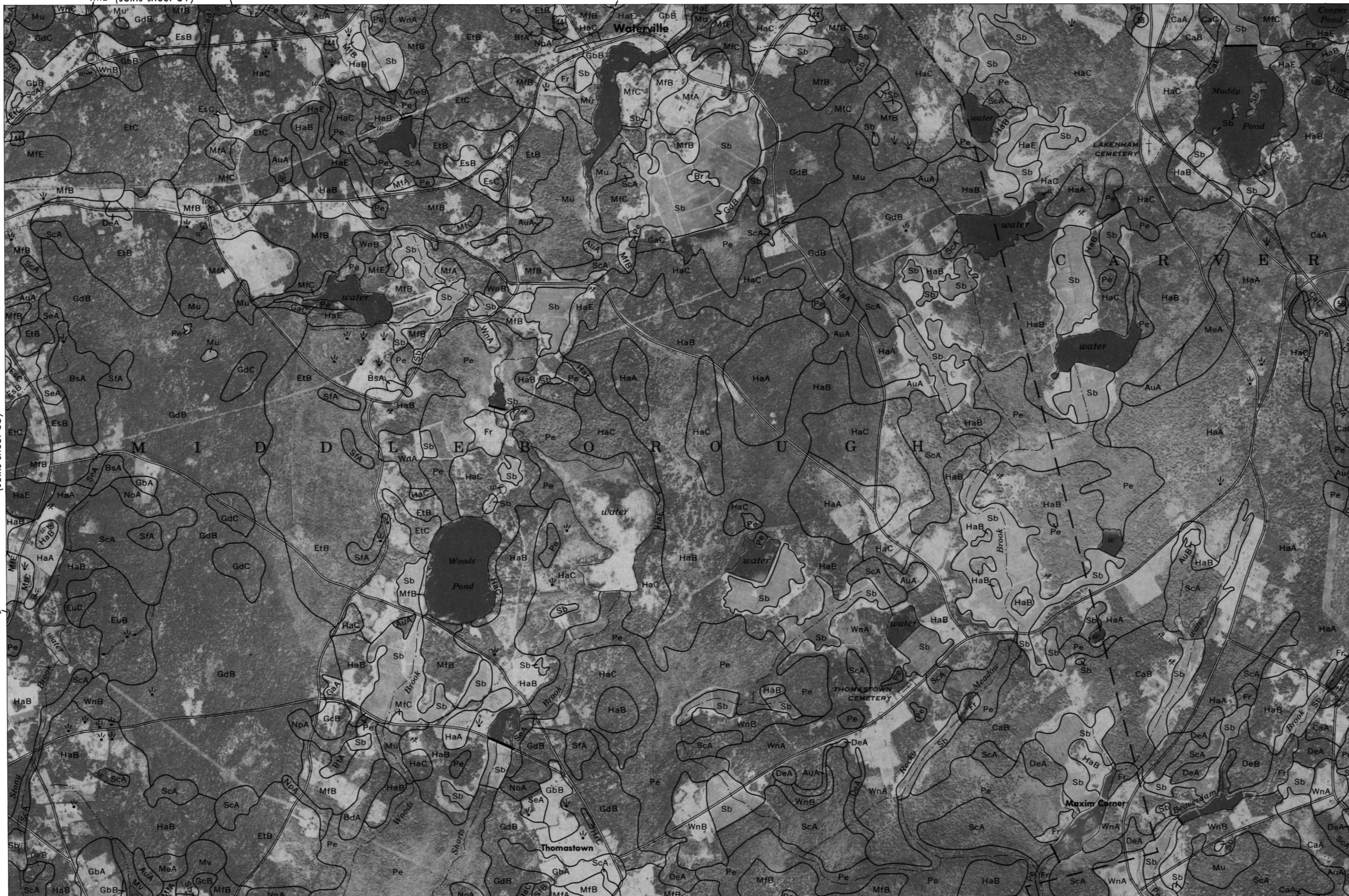
(Joins sheet 36)

(Joins sheet 41)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

36

(Joins sheet 31)



(Joins sheet 35)

(Joins sheet 37)

(Joins sheet 42)

0 ½ 1 Mile   Scale 1:20 000   0 5000 Feet

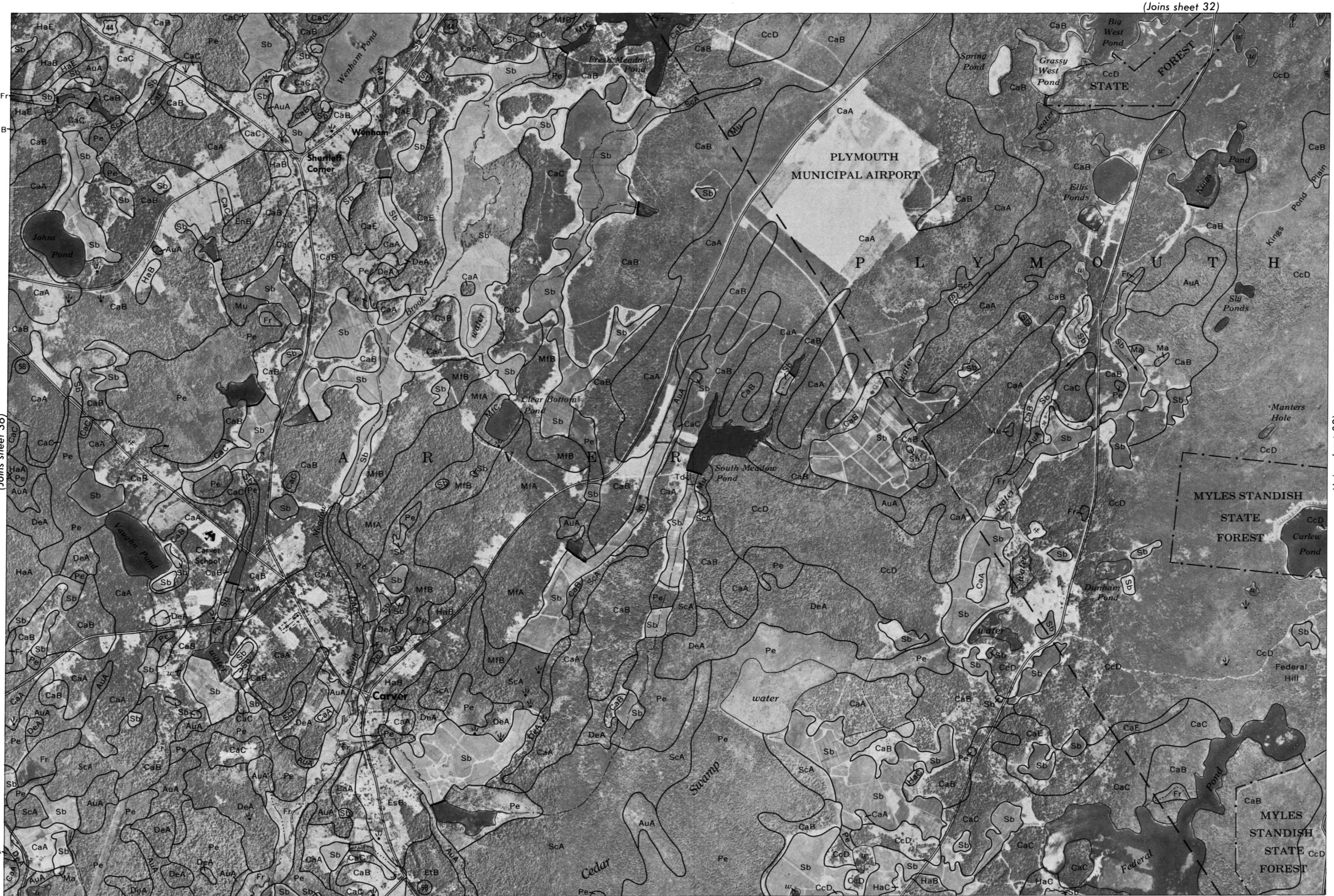
PLYMOUTH COUNTY, MASSACHUSETTS NO. 36

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

37

(Joins sheet 32)

(Joins sheet 36)



(Joins sheet 38)

(Joins sheet 43)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 37

38

(Joins sheet 33)

(Joins sheet 37)

(Joins sheet 39)

(Joins sheet 44)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

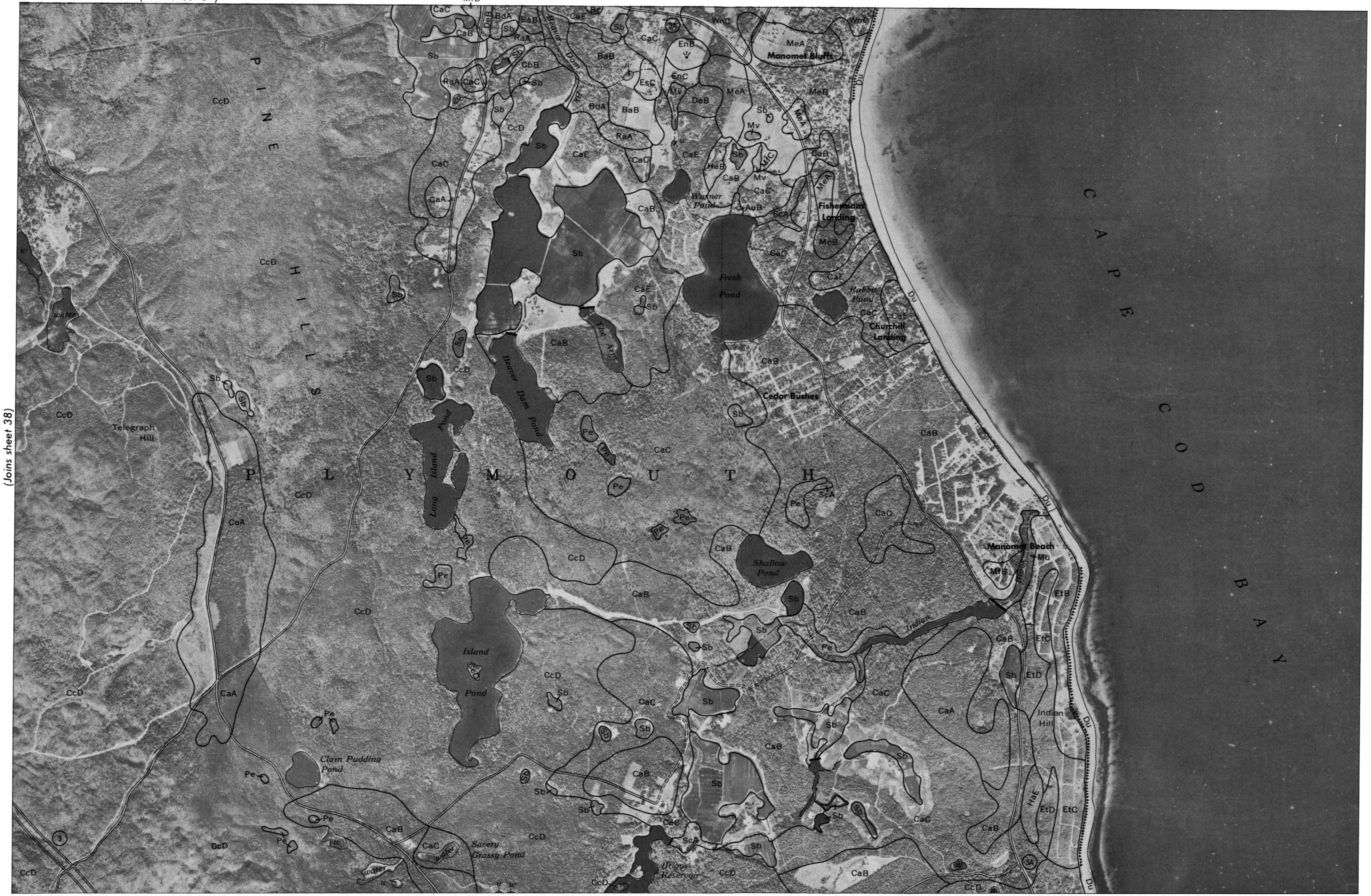
PLYMOUTH COUNTY, MASSACHUSETTS NO. 38

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

39

(Joins sheet 34)

(Joins sheet 38)



(Joins sheet 45)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 39

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

4

N

(Joins inset, sheet 5)

(Joins sheet 3)

(Joins sheet 5)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

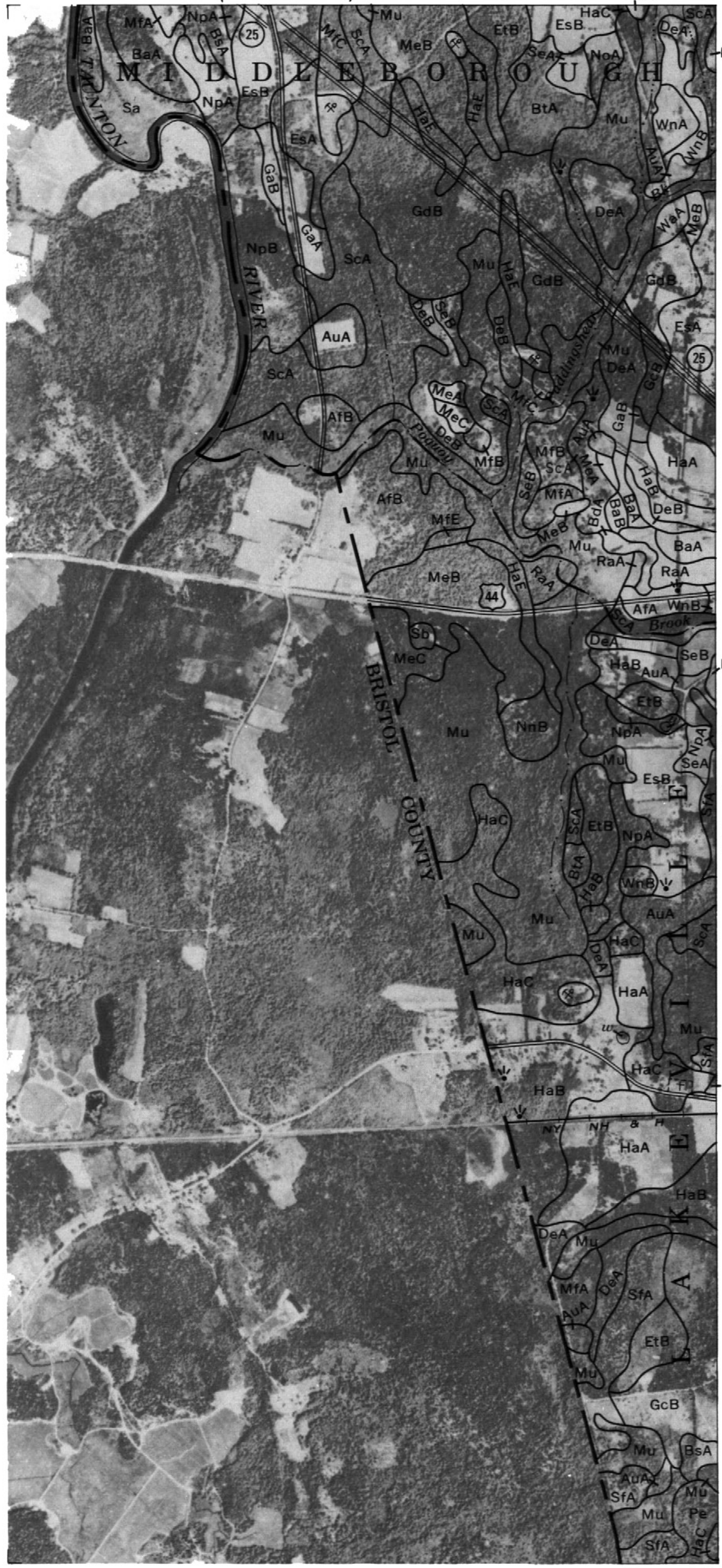
(Joins sheet 7) | (Joins sheet 8)

PLYMOUTH COUNTY, MASSACHUSETTS NO. 4

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 29)

(Lower left)



(Joins sheet 35)

(Joins sheet 41)

(Upper right)

(Joins sheet 46)

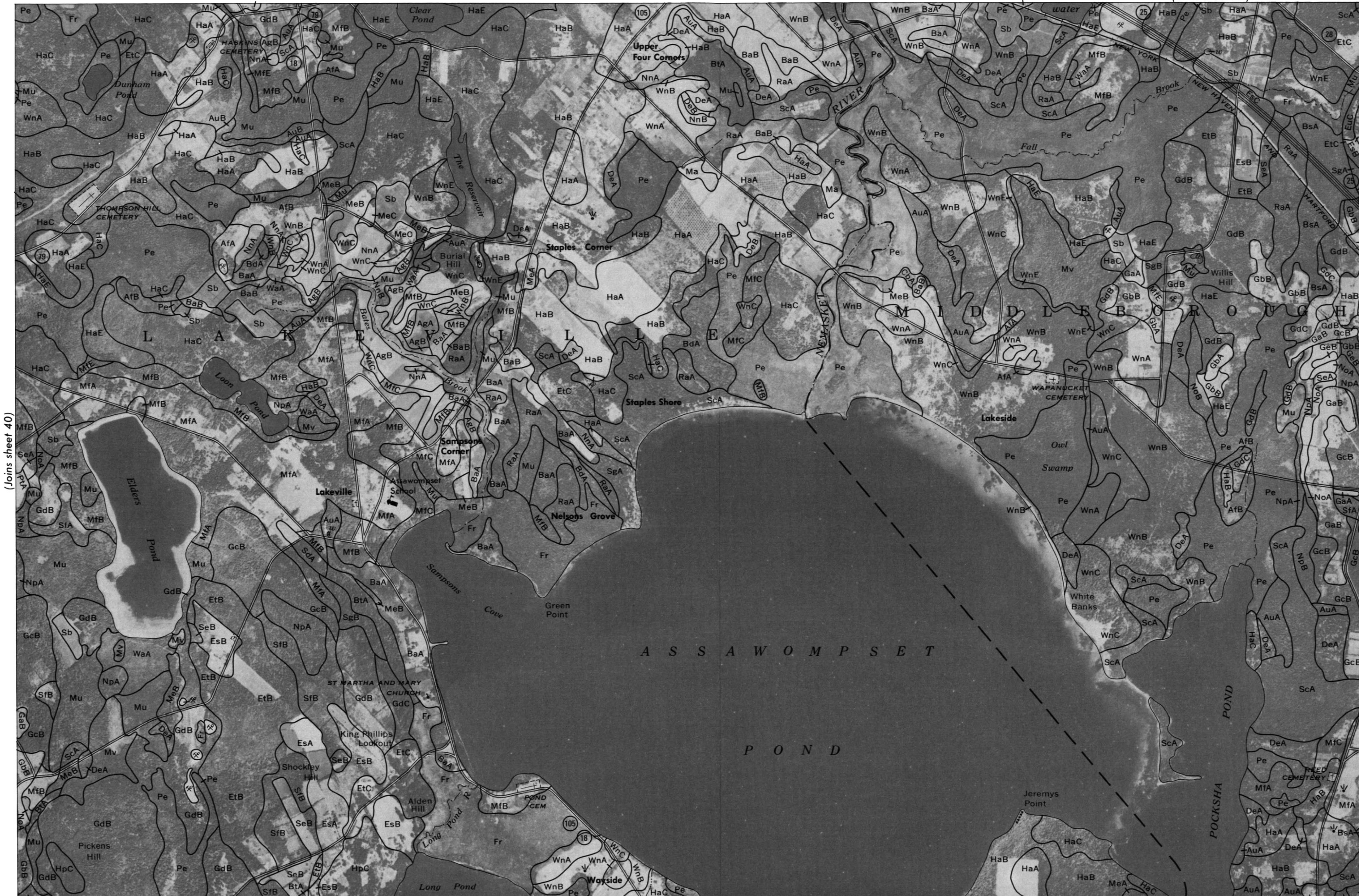
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 40

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

41

(Joins sheet 35)



(Joins sheet 40)

(Joins sheet 42)

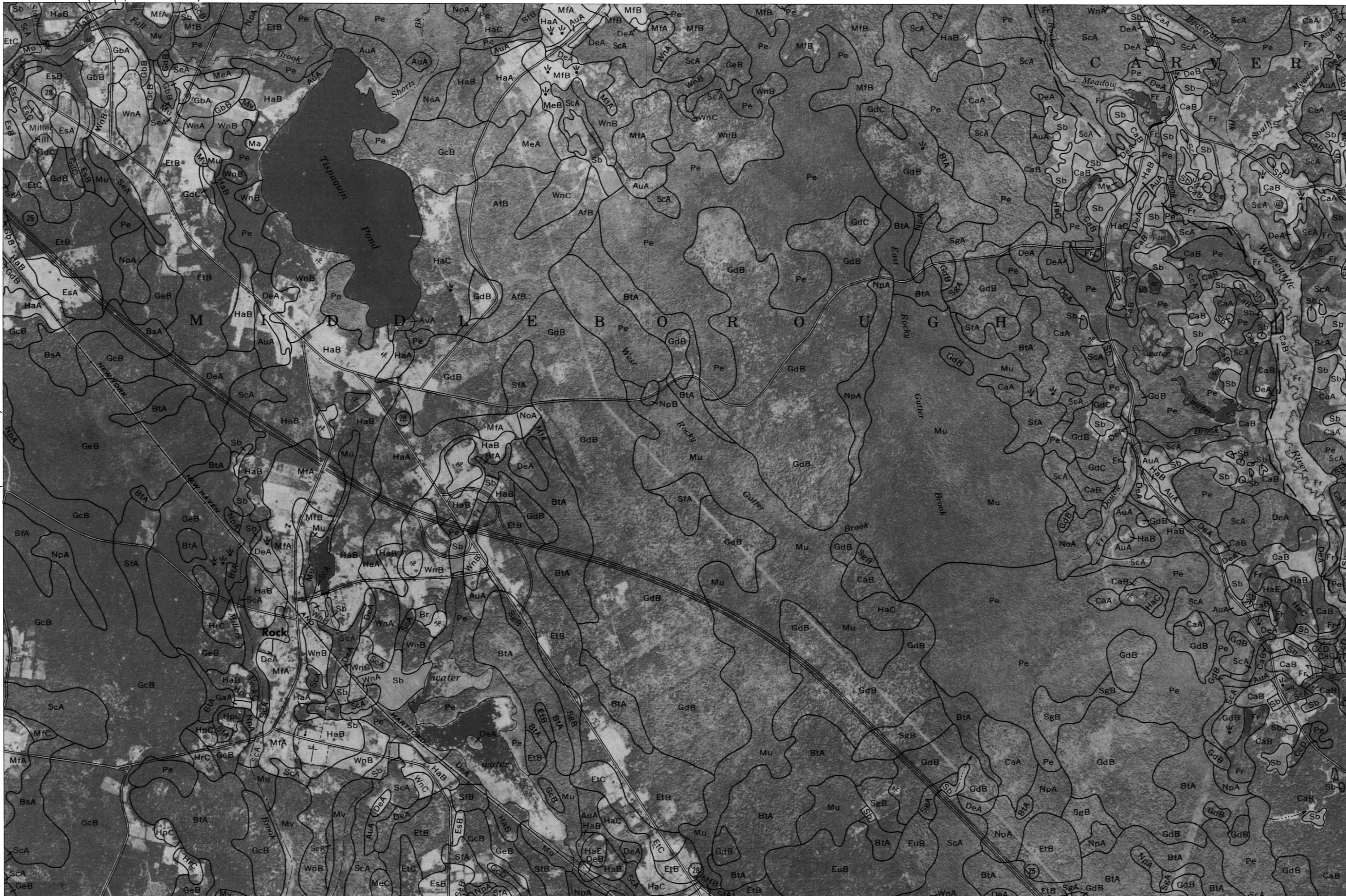
(Joins sheet 47)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 41

42

(Joins sheet 36)



(Joins sheet 41)

(Joins sheet 43)

(Joins sheet 48)

Scale 1:20 000

0 ½ 1 Mile

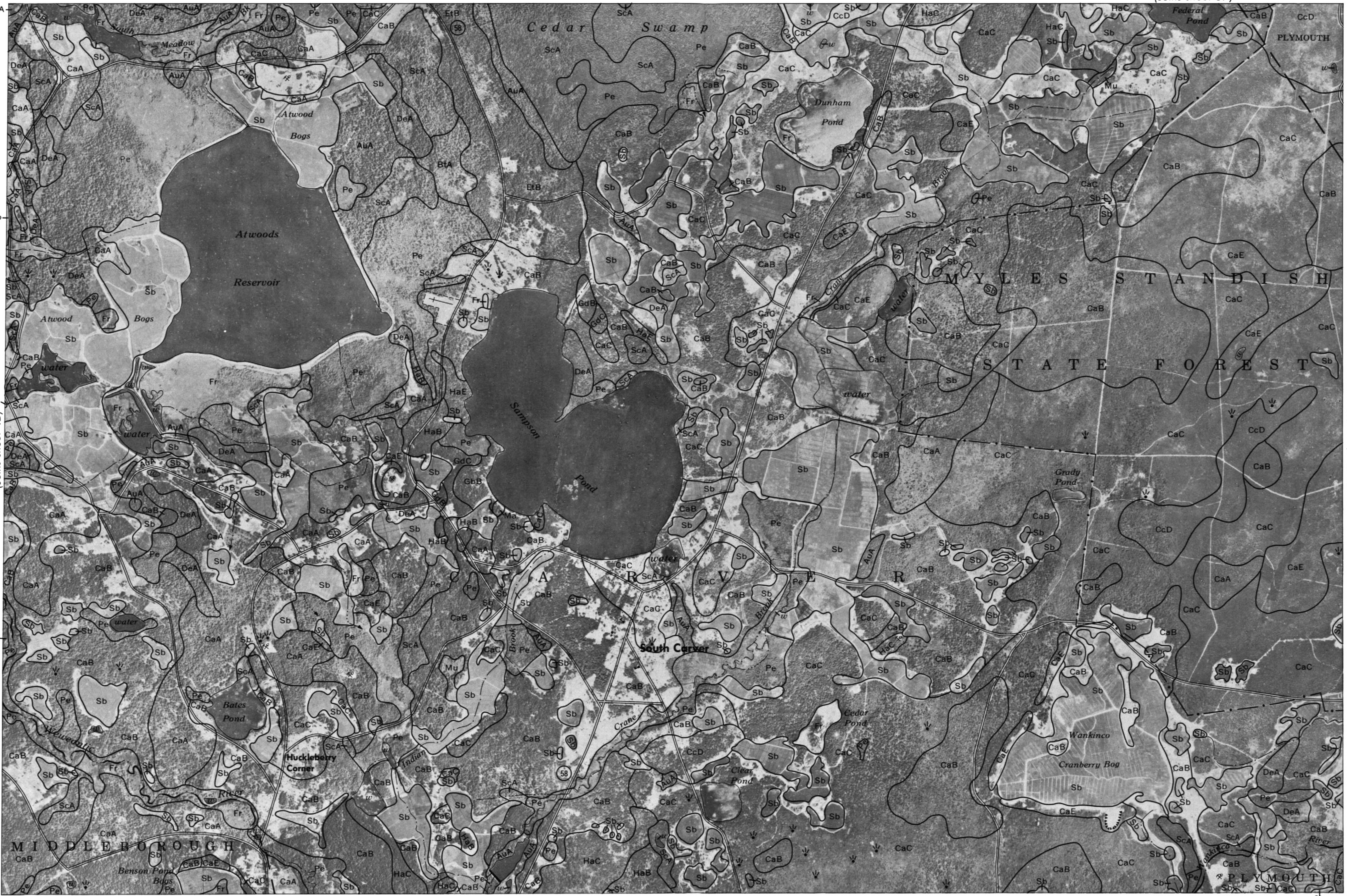
0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 42

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 37)

43



(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 49)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 43

(Joins sheet 38)

(Joins sheet 43)

(Joins sheet 45)

(Joins sheet 50)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

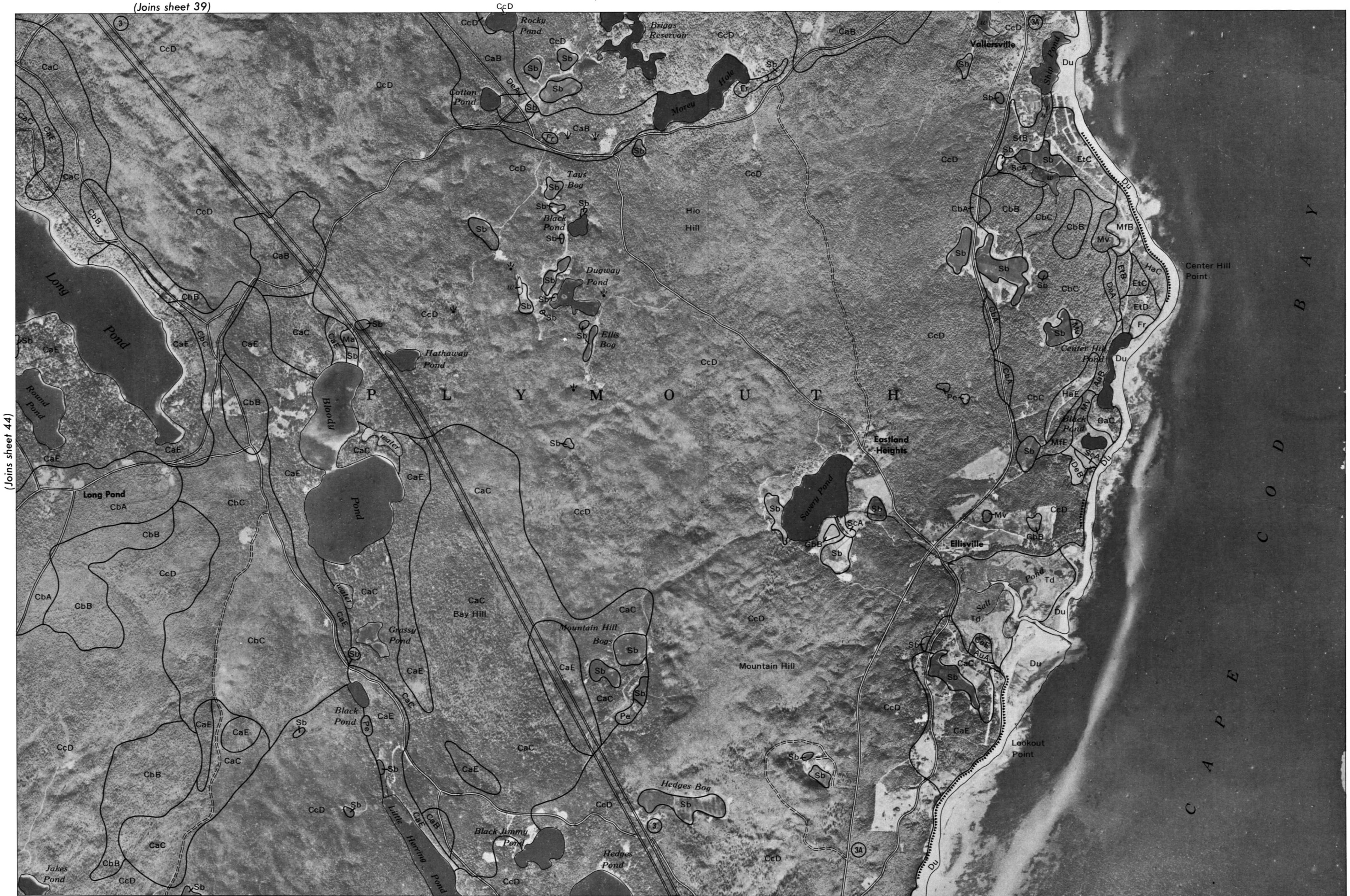
PLYMOUTH COUNTY, MASSACHUSETTS NO. 44

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

45

(Joins sheet 39)

(Joins sheet 44)



(Joins sheet 51)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 45

PLYMOUTH COUNTY, MASSACHUSETTS — SHEET NUMBER 46

N

(Joins sheet 40)

(Joins sheet 47)

(Joins inset, sheet 52)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 46

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

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PLYMOUTH COUNTY, MASSACHUSETTS NO. 47

48

(Joins sheet 42)

(Joins sheet 47)

(Joins sheet 49)

(Joins sheet 53)

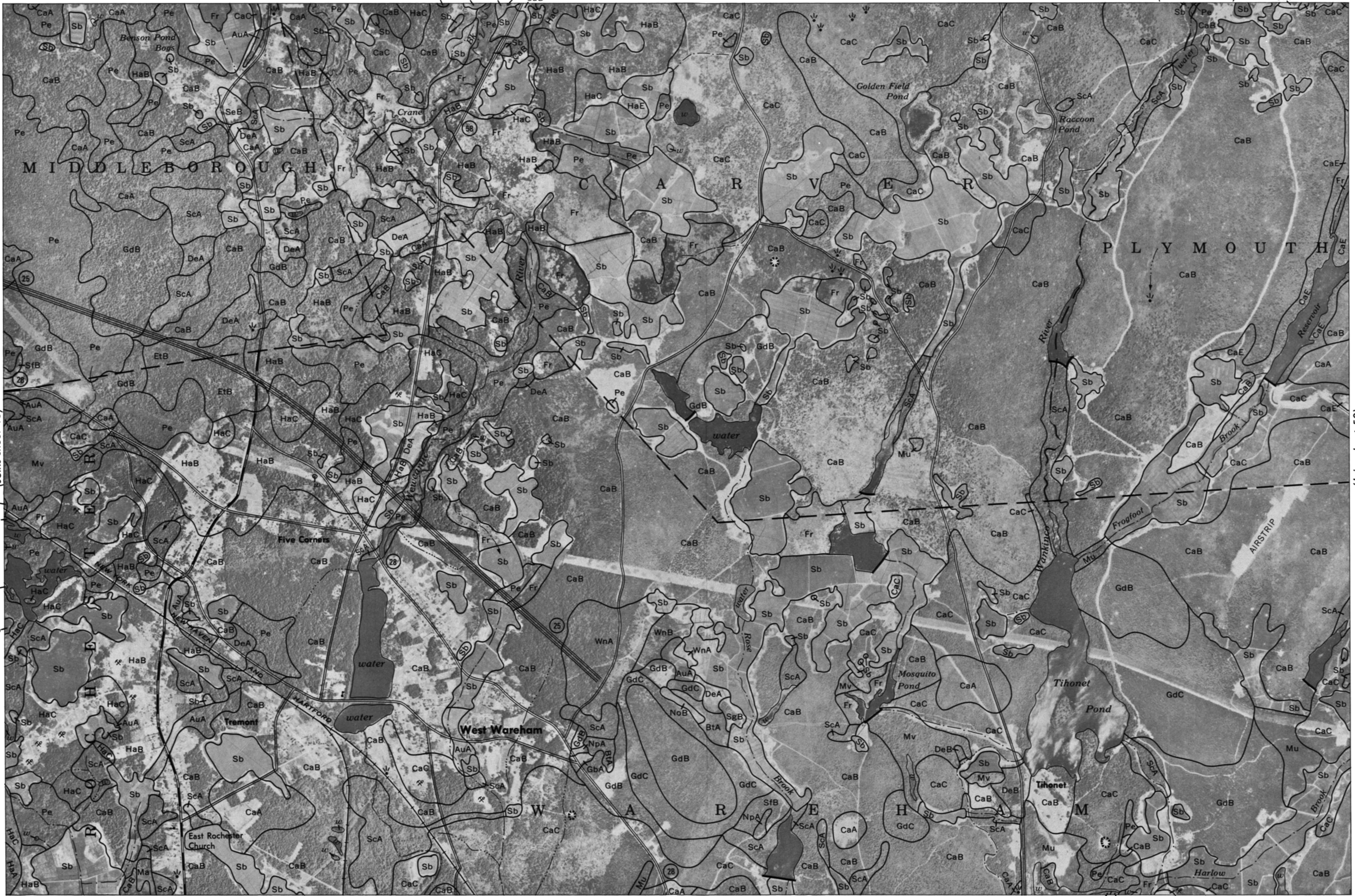
0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 48

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

49

(Joins sheet 43)



(Joins sheet 48)

(Joins sheet 50)

(Joins sheet 54)

Scale 1:20 000

0 ½ 1 Mile

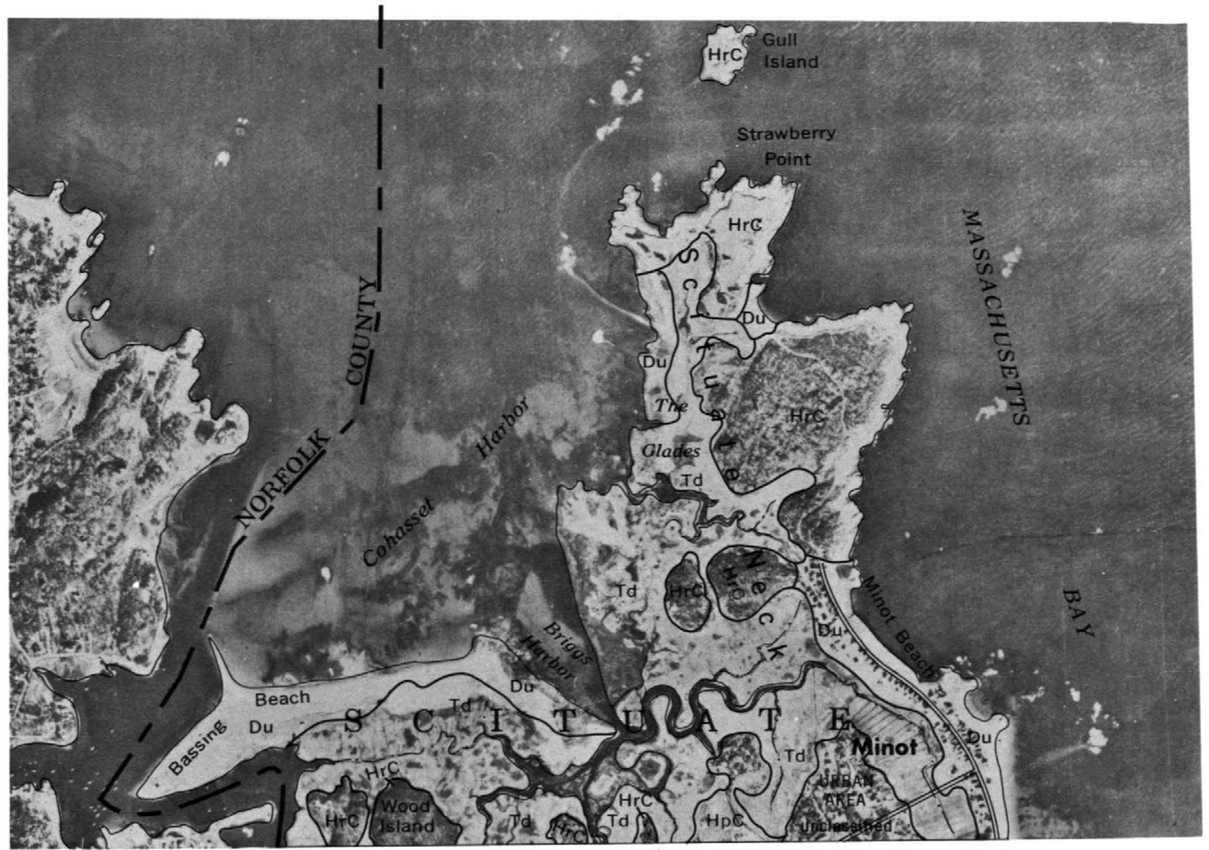
0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 49

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

N

(Joins sheet 8)



(Joins sheet 4)

0 ½ 1 Mile

Scale 1:20 000

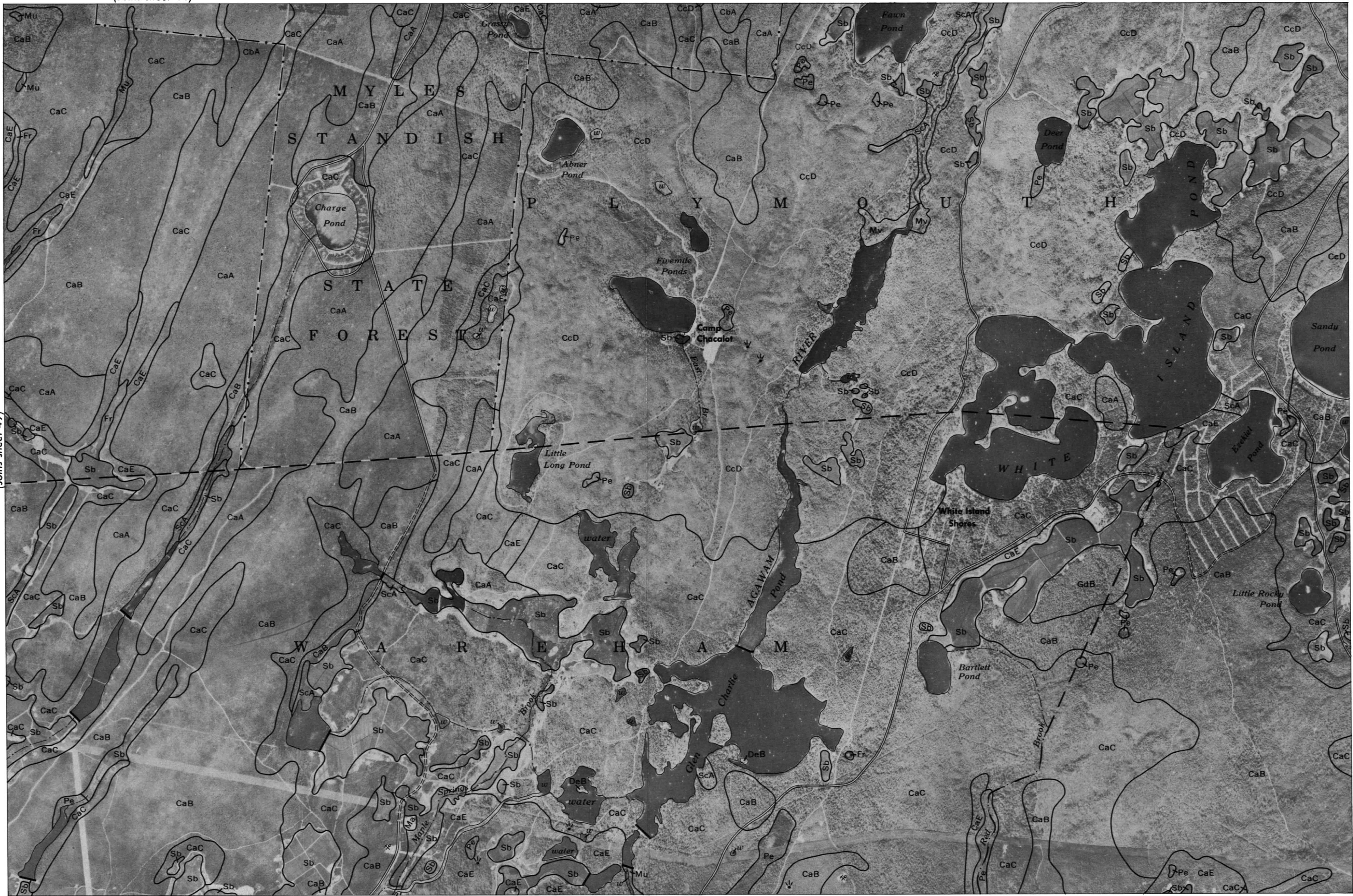
0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 5

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 44)

(Joins sheet 49)



(Joins sheet 51)

(Joins sheet 55)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 50

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

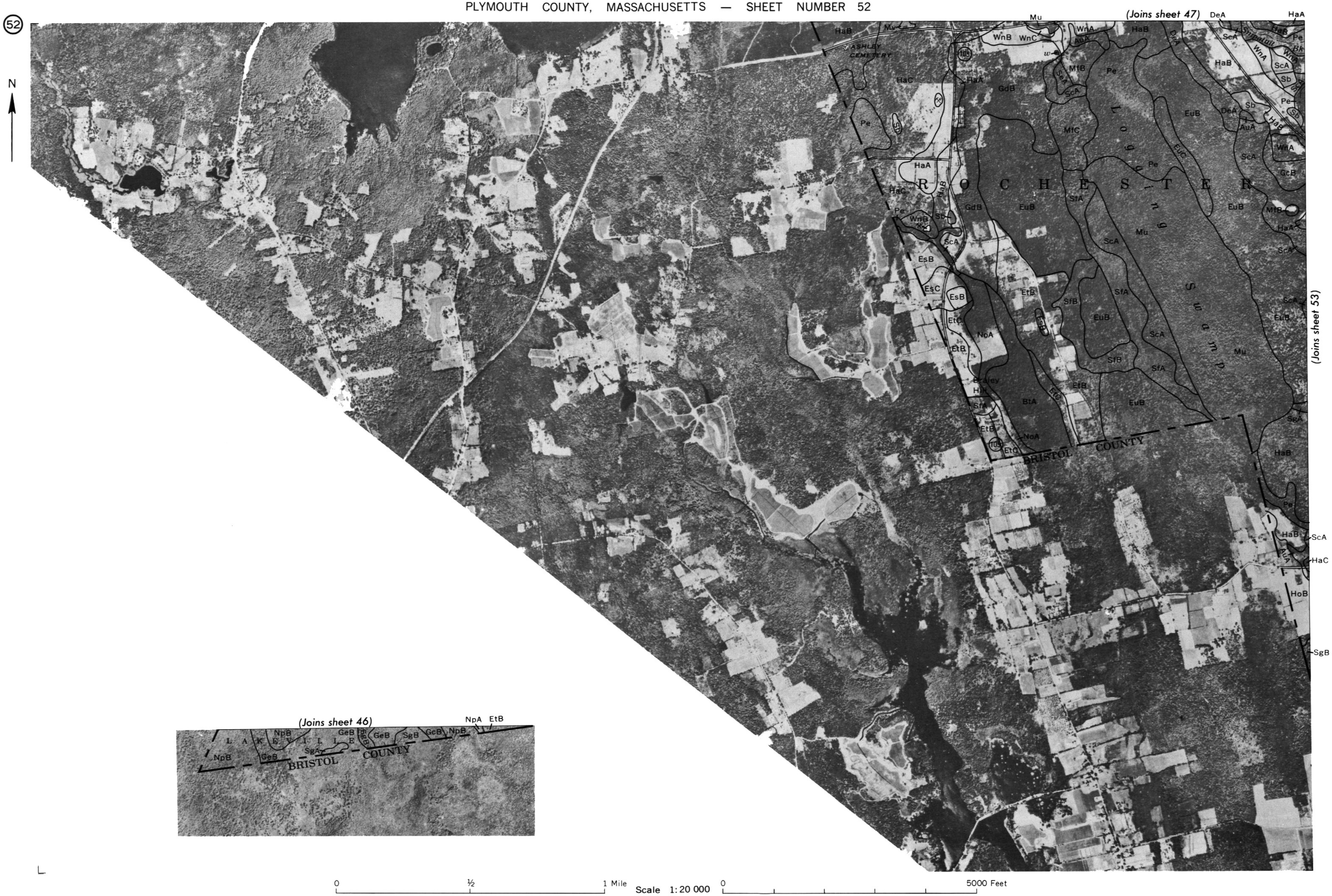
51

(Joins sheet 45)

(Joins inset)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.



Scale 1:20 000

PLYMOUTH COUNTY, MASSACHUSETTS NO. 52

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 48)

(Joins sheet 52)

(Joins sheet 54)

(Joins sheet 56)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(54)

(Joins sheet 49)

(Joins sheet 53)

(Joins sheet 55)

(Joins sheet 57)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

N

PLYMOUTH COUNTY, MASSACHUSETTS, SHEET NO. 54

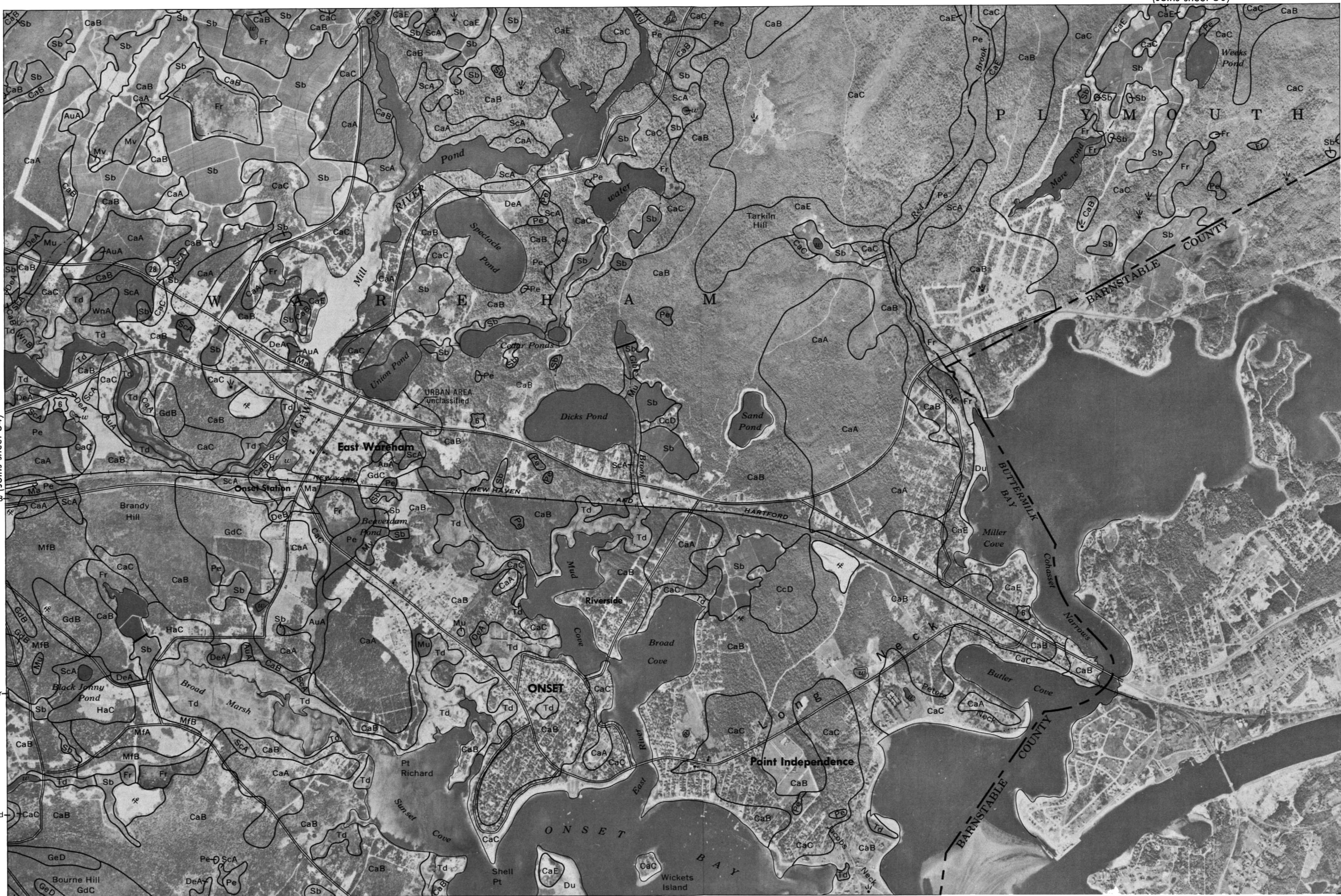
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 50)

55

(Joins inset, sheet 51)

(Joins sheet 54)



(Joins sheet 58)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 55

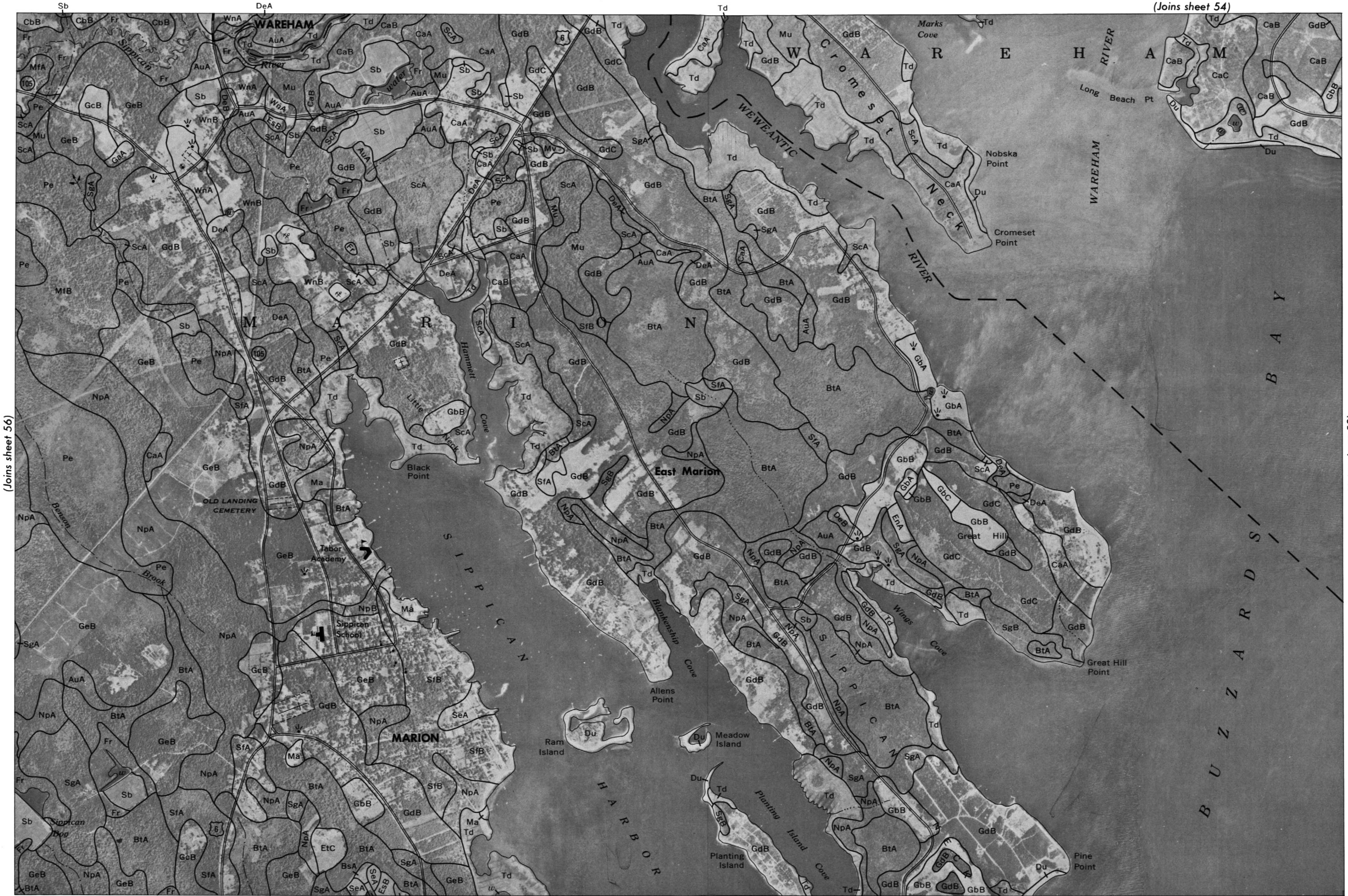
PLYMOUTH COUNTY, MASSACHUSETTS NO. 56

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(57)

(Joins sheet 54)

(Joins sheet 56)



(Joins sheet 58)

(Joins sheet 60)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 57

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

58

(Joins sheet 55)

(Joins sheet 57)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 58

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

59

(Joins sheet 56)

N

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 59

(Joins sheet 60)

(Joins sheet 61)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 3)

(Joins sheet 7)

(Joins sheet 10)

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 6

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 57)

(Joins sheet 59)

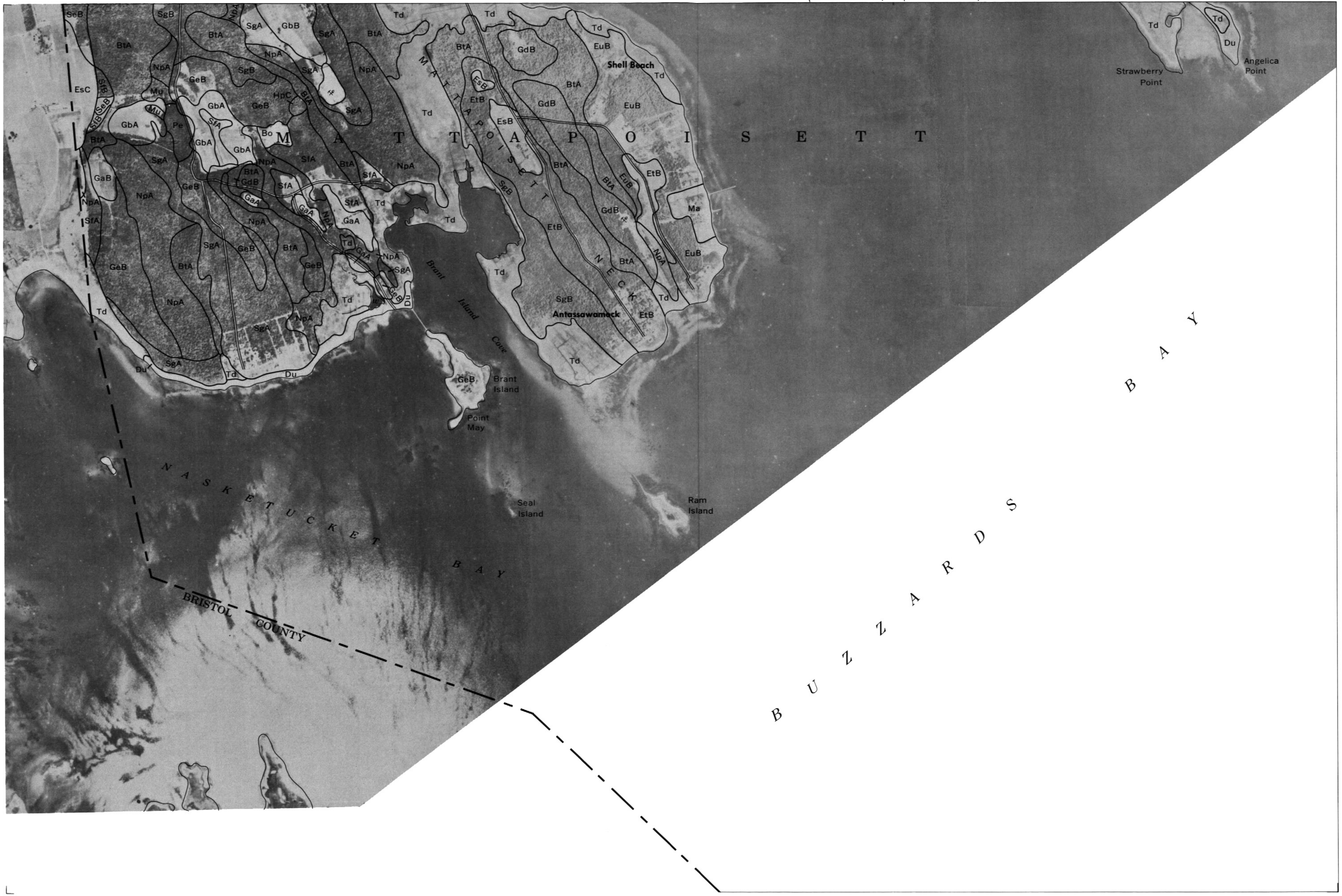
(Joins sheet 61)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 60

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

(Joins sheet 59) | (Joins sheet 60)

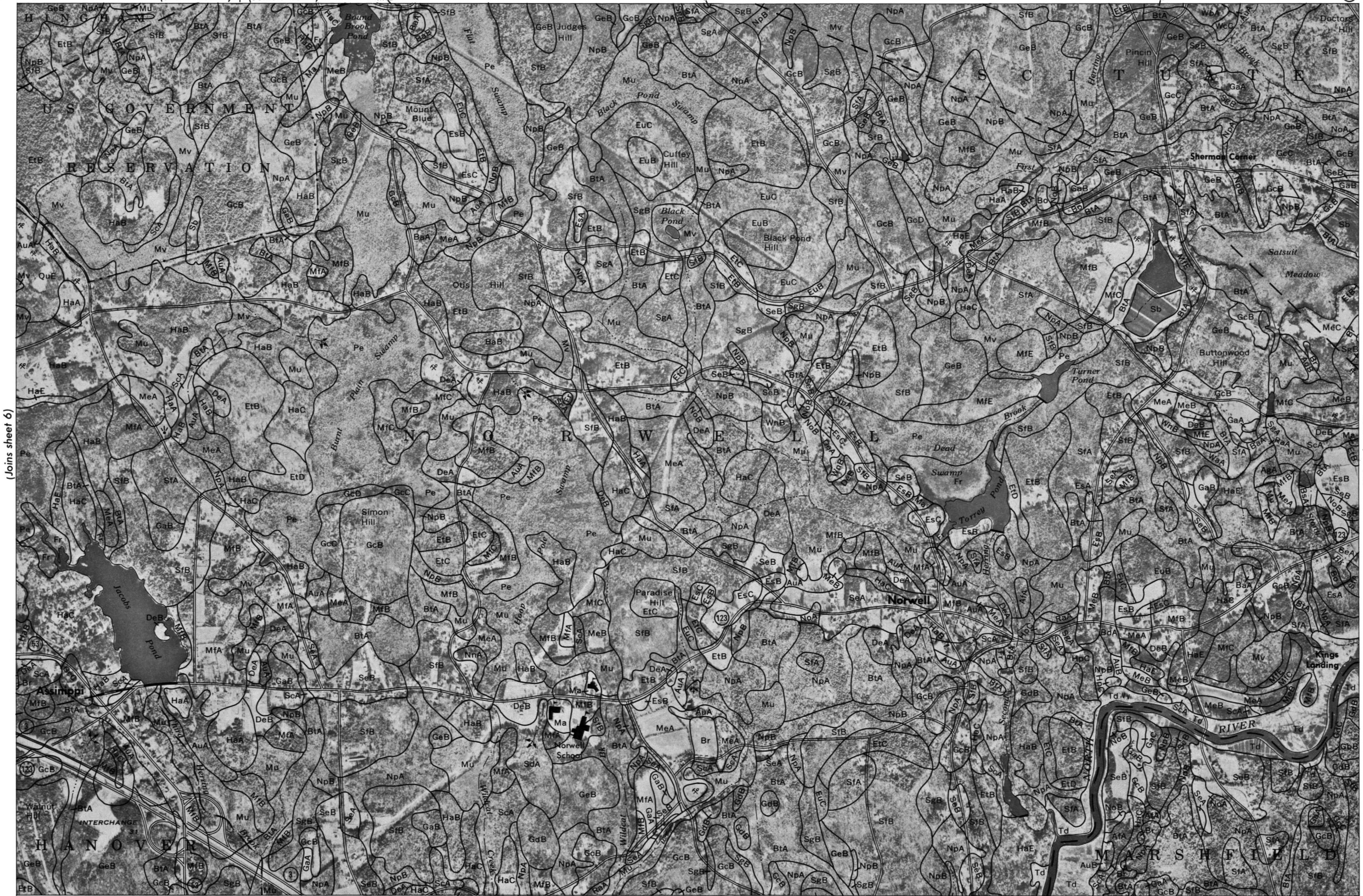


0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS — SHEET NUMBER 7

7

(Joins sheet 3) | (Joins sheet 4)



(Joins sheet 6)

(Joins sheet 8)

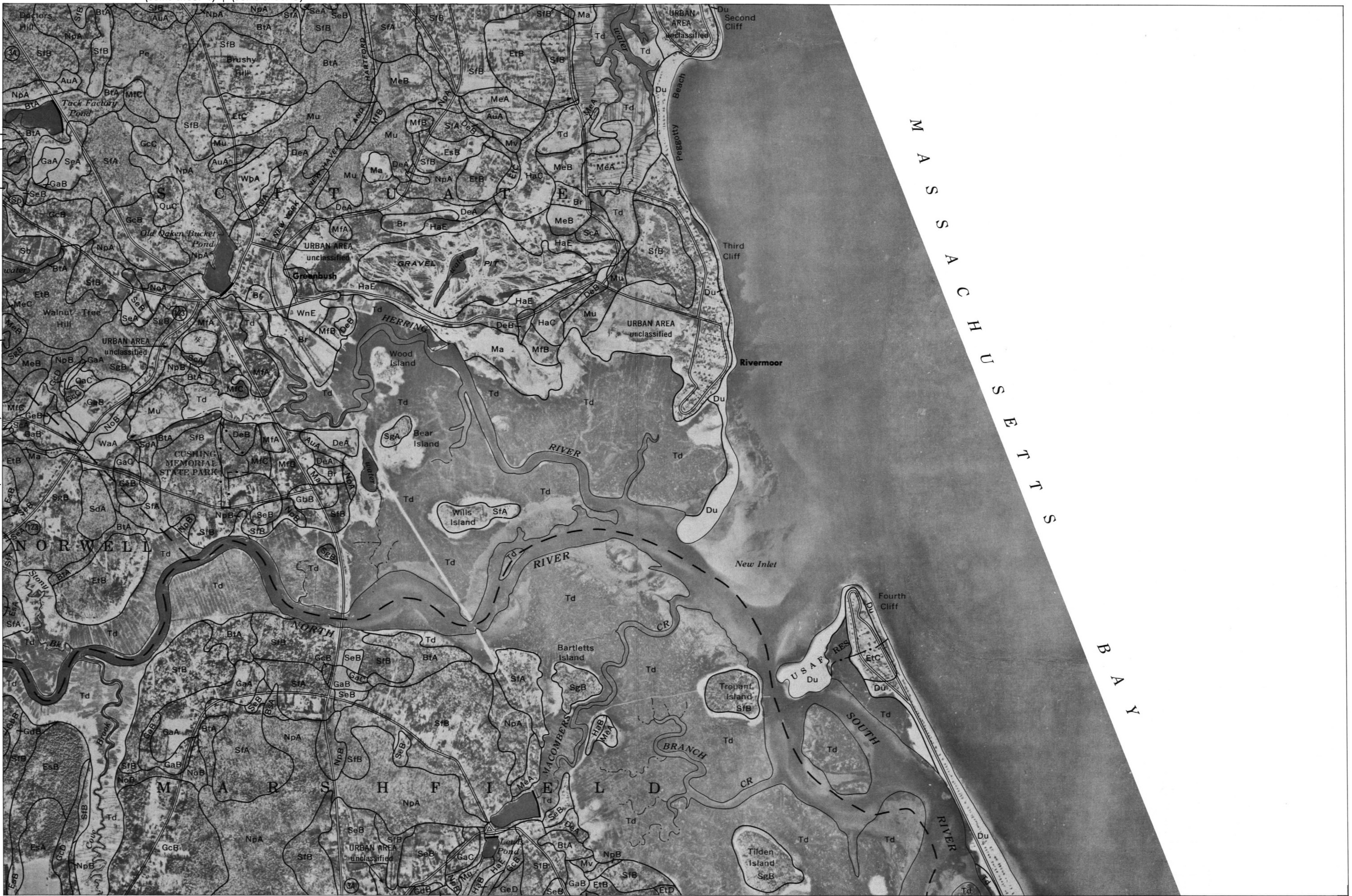
(Joins sheet 11)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.

PLYMOUTH COUNTY, MASSACHUSETTS NO. 7

(Joins sheet 4) | (Joins sheet 5)

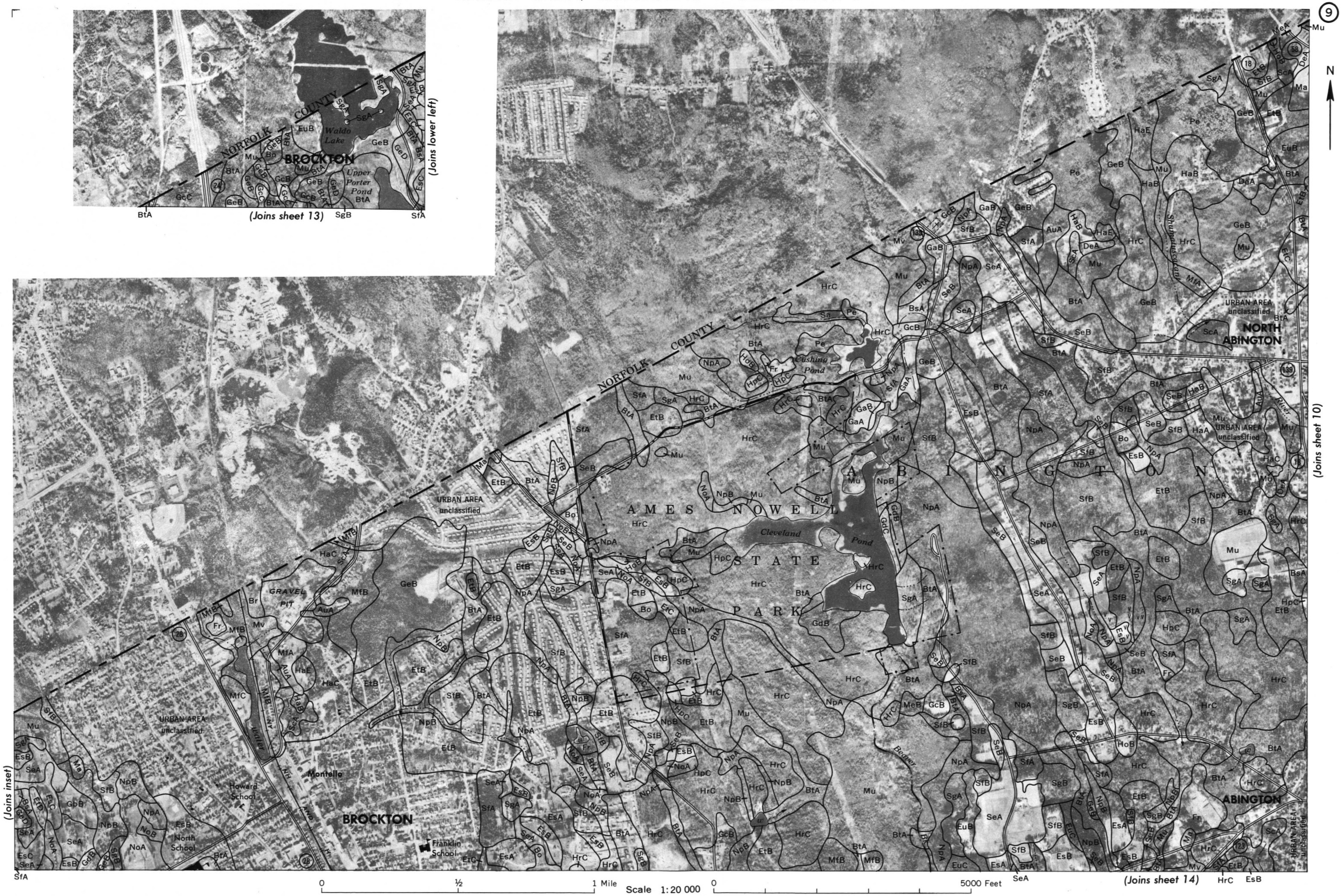


(Joins sheet 12)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

PLYMOUTH COUNTY, MASSACHUSETTS NO. 8

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.



PLYMOUTH COUNTY, MASSACHUSETTS NO. 9

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Massachusetts Agricultural Experiment Station.